

PRELIMINARY HYDROLOGY AND HYDRAULICS STUDY FOR THE MR 56 COMMERCIAL SITE

PORTIONS OF APN 331-120-066

**CITY OF MENIFEE
CALIFORNIA**

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**JULY 31, 2017
REVISED:
JANUARY 31, 2018**

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This report has been prepared by or under the direction of the following registered civil engineer who attests to the technical information contained herein. The registered civil engineer has also judged the qualifications of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.



01/30/2018

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Date

Seal



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I. PURPOSE AND SCOPE

The MR 56 Commercial Site is a proposed commercial project located in the City of Menifee. The project will construct buildings, parking lots, utility infrastructure, two bioretention planters, and an interim basin. The project is building the easterly side of the project that fronts Highway 74, and the westerly portion of the project site will be developed at a later date.

The scope of the study includes the following:

1. Determination of points of flow concentration and watershed subareas for the onsite.
2. Determination 100-year peak storm flows based upon the pre-project and post-project condition utilizing the Rational Method as outlined in the Riverside County Hydrology Manual.
3. Perform pre-project and post-project unit hydrograph hydrology calculations for the area tributary to the interim basin for the 2-year, 5-year, 10-year 1-hour, 3-hour, 6-hour and 24-hour storm durations, and the 100-year, 1-hour storm duration utilizing the Unit Hydrograph method as outlined in the Riverside County Hydrology Manual.
4. Determine the required storm drain infrastructure to intercept the tributary flows.
5. Determine the required water quality volume and flow rate to be treated within the subsurface system.
6. Determine the required volume to be stored in order to retain the 2-year, 24-hour storm duration volume.
7. Determine the volume to be stored to meet the interim criteria for sizing increased runoff detention facilities.
8. Preparation of a hydrology report, which consists of hydrological and analytical results and exhibits.

II. PROJECT SITE AND DRAINAGE AREA OVERVIEW

The proposed project will construct commercial buildings, a gas station, restaurants, parking lot area, street improvements, storm drain and utility infrastructure, two bioretention basins, and an interim increased runoff basin. The actual project improvements area 7.4 acres, with 14.6 acres being included as a part of this study. The project site is roughly bounded by Briggs Road to the east, Highway 74 to the south, Malaga Road to the west, and Marion V. Ashley Community Center to the north.

The project site is developing the easterly portion of the project site and constructing an interim basin on the westerly portion. The project site is tributary to the future Line A5 Master Drain Plan facility, which once constructed, will convey flows to Canyon Lake through engineered and maintained facilities. The project site would only be required to mitigate to the capacity of the facility, rather than to pre-project conditions, however, the project will implement the interim criteria for sizing increased runoff detention facilities until the Master Drain Plan Line A5 is constructed.

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A total of 14.6 acres of area is included in the rational method hydrology analyses for this project, however, only 11.5 acres of area is included in the unit hydrograph analyses. The 11.5 acres is the area tributary to the interim basin. The project site will mitigate flows from the total 11.5 acres of area, which includes offsite area and existing undeveloped area. This will ensure that the project will not adversely impact downstream properties.

III. HYDROLOGY

The Riverside County Hydrology Manual (Reference 1), was used to develop the hydrological parameters for the hydrology analyses. The rational method calculations were performed using the computer program developed by Civil Cadd/Civil Design.

The existing soil classification for the area consists of Hydrologic Soil Group “A” and “C”, as shown in Exhibit F. Exhibit F is a Soils Map obtained from the United States Department of Agriculture’s Natural Resources Conservation Service WebSoil Survey. An Antecedent Moisture Condition (AMC) I was utilized for the 2-year and 5-year storm events, and an AMC II was utilized for the 10-year and 100-year storm event, as recommended by the Riverside County Hydrology Manual.

The rainfall values were obtained from the Riverside County Hydrology Manual’s Isohyetal Maps, and are summarized below:

Storm Event	1-hour	3-hour	6-hour	24-hour
2-Year	0.45	0.80	1.00	1.60
100-Year	1.20	1.80	2.50	4.10

The slope of intensity duration curve value is 0.50. The rainfall maps and the Slope of Intensity Duration Curves have been included as Exhibit G.

The pre-project condition was analyzed using undeveloped – poor cover land use for the open space/undeveloped area and commercial land use for the existing Briggs Road and Highway 74. The post-project condition utilized commercial land use for the onsite area, undeveloped – poor cover for the undeveloped offsite areas, and commercial area for the existing and proposed street improvements. It should be noted that the pre-project and post project rational method hydrology calculations differ by 0.4 acres, and this is due to the widening of Briggs Road.

The rational method analyses analyzed a total of 14.6 acres, while the unit hydrograph analyses only analyzed 11.5 acres. The 3.1 acre discrepancy accounts for the 3.1 acres downstream of node 116 (watershed subareas A10 and A11). Since the project site does not discharge into an approved MS4 facility or Master Drainage Plan facility, the project must meet the interim basin design criteria which requires mitigation of the 2-year, 5-year, 10-year storm events for the 1-hour, 3-hour, 6-hour and 24-hour storm durations. Additionally, the

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100-year, 1-hour storm event was analyzed to determine the peak flow rates tributary to the basin. More discussion on the mitigation is included in Section V.

The pre-project condition rational method hydrology calculations have been included in Appendix A, and the pre-project rational method hydrology map has been included as Exhibit A. The post-project condition rational method hydrology calculations have been included in Appendix B, and the post-project condition rational method hydrology map has been included as Exhibit B. The pre-project and post-project condition unit hydrograph analyses have been included in Appendices C and D, respectively, and the pre-project and post-project unit hydrograph maps has been included as Exhibits C and D, respectively.

IV. HYDRAULICS

The project will utilize subsurface storm drain, bioretention basins and an interim basin to flood protect the site and convey the tributary flows.

The two bioretention basins will incorporate drop inlet structures that will have weir flow lines that are 0.5 feet above the soil media, with 0.5 foot high openings. The drop inlets have been sized to convey the peak 100-year tributary flow rates as determined by the rational method hydrology. The drop inlet sizing calculations have been included in Appendix E.

Several parkway drains and curb openings will be utilized to intercept flows. During final engineering, when all the laterals and inlets are sized in detail, the parkway drain and curb openings will also be sized, however the flows range from $0.3 \text{ ft}^3/\text{s}$ to $1.4 \text{ ft}^3/\text{s}$, and all but one parkway drain/curb opening are located in low-points, therefore flow-by analyzes are not required. Since these flows are minimal, the minimum parkway drain and curb openings will be sufficient, and therefore will be sized in detail during final engineering. The parkway drain located on a slope is at the corner of Highway 74 and the entrance road/driveway adjacent to the basin, and collects only 0.03 acres of area, which will generate minimal runoff.

Catch Basin calculations were performed for Catch Basin 1 and 2. Catch Basin 1 is the inlet located on Briggs Road, and Catch Basin 2 is the inlet located on Highway 74. The peak 100-year flow rates were utilized to size the catch basins, and the sizes of the catch basins were maximized to minimize bypass flow rates.

The proposed storm drain systems incorporate minimum slopes of 0.5% during the preliminary stages, and were sized using normal depth calculations. During final engineering, detailed water surface profile gradient program calculations will be performed to validate the sizing of the systems. The storm drain systems utilized the flow rates from the rational method hydrology calculations. Line B2 utilized the same flow rate as Line B1, which used the total flow rate for sub-watershed areas A5 and A6 ($8.99 \text{ ft}^3/\text{s}$). Since this is the largest flow rate that either Line B1 or Line B2 could experience, this is considered conservative. During final engineering, detailed hydrology to each inlet and storm drain will

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be performed to more accurately size the systems, however, the sizes shown are the most conservative sizes possible. The storm drain normal depth calculations have been included in Appendix E.

The interim basin will incorporate an earthen ditch that will convey the flows discharging from the basin. The channel will have a 10 foot wide base, and a slope of 0.55%. Using these parameters and a flow rate of 20.50 ft³/s (which is the post-project condition flow existing unit hydrograph flow rate for the area tributary to the basin), the depth will be 0.74 feet. The existing flow rate for the 100-year unit hydrograph calculations was utilized during the preliminary stages since the post-project flow rate will not exceed this flow rate. During final engineering, detailed basin routing calculations will be performed to determine the peak basin outflow and the channel calculations will be adjusted accordingly.

V. WATER QUALITY AND MITIGATION

The project will treat the required water quality volume via bioretention in one of 2 bioretention basins, as well as a self-retaining area within the interim basin.

The required water quality volume to be treated was determined using the Santa Ana BMP Design Volume Spreadsheet. The rainfall depth utilized was 0.65 inches, and was obtained from the Isohyetal Map for the 85th Percentile 24-hour Storm Event (included in Appendix 6). Since the project site is a commercial site and street area, it is assumed that the project is 90% impervious, which is a conservative assumption considering the project site includes 2 bioretention basins, on top of the commercial site.

The project site will utilize two bioretention basins with soil media depths of 2 feet and 2.5 feet (due to the availability of cover and the site elevations). Flows will then be conveyed to the interim basin that will mitigate for the hydrologic conditions of concern (as well as act as a self-retaining area for a small westerly portion of the site). This basin is required until such a time when the MDP Line A-5 system is completed, which will then allow for the project to discharge directly into the Line A system, and be conveyed via engineered and maintained channels to Canyon Lake. Additionally, a water quality BMP or mechanism will be required for the DMA D that drains to the basin, which is an area draining to a self-retaining area. However, during this phase of the development, the Line A-5 system is not being constructed, therefore addressing the hydrologic conditions of concern is required.

The bioretention basins were sized using the average top width and the Santa Ana Watershed Bioretention Design Worksheets. An additional spreadsheet for irregular surface areas was utilized, since the basins have varying top widths. Both spreadsheets indicate that the basins are adequately sized. The bioretention basins utilize 24" of soil media, which is to ensure that the flows discharging from the underdrains will be able to enter the interim basin. The interim basin invert is 1513, and the basins have tops of soils of 1518 and 1521.5, respectively. Both Bioretentions provide a total of 1 foot of depth, which includes 0.5 feet of depth for the water quality volume, and 0.5 feet of depth to allow the 100-year flow rate to

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discharge from the basin. Detailed outlet structure analyses will be performed during final engineering, however, the design as proposed will be sufficient to function from a water quality perspective and a 100-year outflow perspective.

The bioretention basins incorporate 4:1 side slopes within the first 0.5 feet of depth (where the water quality volume will pond) and incorporates 2:1 side slopes above the 0.5 feet of depth.

It should be noted that the westerly side of the west access street and the westerly portion of the Highway 74 improvements will be treated once the westerly side of the project is developed. It was not feasible to intercept these street improvements due to the site grades and existing grades, however, these areas will be treated with the westerly phase of the project site when the interim basin is removed. Additionally, the entire tributary area of the east side of Briggs Road will be intercepted in Bioretention Basin B and treated for water quality purposes. The required area within Highway 74 and Briggs Road that is required to be treated is 55,510 sq. ft. and the total treated area from Briggs Road is 59,749 sq. ft., which is more than sufficient to offset the required area in Highway 74 that cannot be intercepted.

DMA D is a small portion of onsite area that cannot be treated within either Bioretention Basin. Therefore, this area will drain into the extended detention basin which will act as a self-retaining area. The required retention depth is 0.78 inches, therefore the outlet for the interim basin will begin at 1" above the basin bottom to provide the required depth.

The water quality calculations have been included in Appendix F.

In order to meet the interim basin design criteria during the preliminary stages of the project, unit hydrograph calculations were performed for the pre-project and post-project conditions for the 2-year, 5-year, and 10-year storm events for the 1-hour, 3-hour, 6-hour and 24-hour storm durations. Additionally, the 100-year storm event was analyzed for the 1-hour storm duration in order to determine the peak flow rate for the 100-year storm event. Based upon the post-project unit hydrograph calculations, the 10-year, 24-hour storm duration generates the largest volume of 1.62 ac-ft. The basin provides 2.93 ac-ft of volume (accounting for 1 foot of freeboard) which is more than sufficient volume to retain the entire 10-year, 24-hour volume. During final engineering, the basin volume will be minimized based upon detailed basin routing calculations. However, during the preliminary stages, the maximum basin envelope was determined, resulting in more than sufficient volume to meet the interim basin design requirements. A summary table of the unit hydrograph results has been included in Appendix G, as well as the interim basin storage volume table.

VII. FINDINGS

The hydrology and hydraulic analyses evaluated the proposed development to determine the necessary drainage improvements required to mitigate flows for increased runoff. It has been concluded that:

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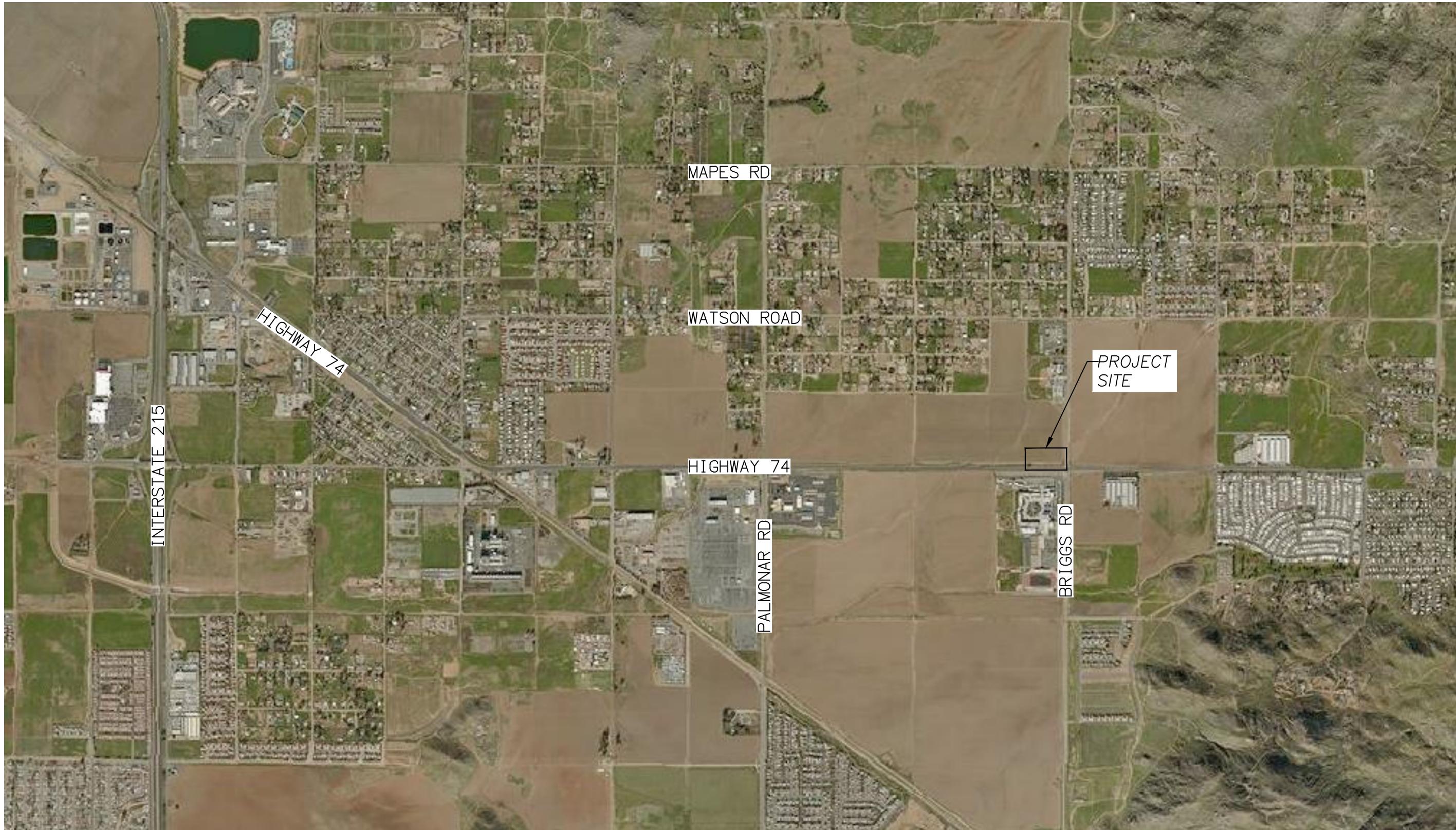
1. The proposed bioretention basins will adequately treat the required BMP Design Volume.
2. The preliminary onsite storm drain systems will adequately convey the peak 100-year flow rates.
3. The proposed interim basin provides more than sufficient volume to meet the interim basin design criteria, and will be reduced to the required size during final engineering when detailed basin routing calculations are performed.

VII. REFERENCES

1. Riverside County Flood Control and Water Conservation District Hydrology Manual, April 1978.
2. Riverside County Flood Control and Water Conservation District Design Handbook for Low Impact Development Best Management Practices, June 2011

FIGURES


FIGURE 1: **VICINITY MAP**



MR 56 COMMERCIAL SITE VICINITY MAP



FIGURE 2: ROMOLAND MASTER DRAINAGE PLAN



APPENDICES

APPENDIX A: PRE-PROJECT CONDITION RATIONAL METHOD HYDROLOGY

APPENDIX A.1: AREA “A” – 100-YEAR STORM EVENT

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 07/28/17 File:ARAEX100.out

250.02.16

100-YEAR RATIONAL TABLING METHOD FOR AREA A
EXISTING CONDITION
FN: ARAEX100.RRV

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 6279

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.450(In.)
100 year, 1 hour precipitation = 1.200(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.200(In/Hr)
Slope of intensity duration curve = 0.5000

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 939.000(Ft.)
Top (of initial area) elevation = 1553.700(Ft.)
Bottom (of initial area) elevation = 1542.000(Ft.)
Difference in elevation = 11.700(Ft.)
Slope = 0.01246 s(percent)= 1.25
TC = $k(0.300)*[(length^3)/(elevation change)]^{0.2}$
Initial area time of concentration = 11.145 min.
Rainfall intensity = 2.784(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.477(CFS)
Total initial stream area = 0.600(Ac.)
Pervious area fraction = 0.100

+++++
Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1542.000(Ft.)
End of street segment elevation = 1527.000(Ft.)
Length of street segment = 1489.000(Ft.)

Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.053
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 2.000(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.388(CFS)
 Depth of flow = 0.358(Ft.), Average velocity = 2.374(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.253(Ft.)
 Flow velocity = 2.37(Ft/s)
 Travel time = 10.45 min. TC = 21.60 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.863
 Decimal fraction soil group A = 0.530
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.470
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 49.39
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 2.000(In/Hr) for a 100.0 year storm
 Subareal runoff = 1.727(CFS) for 1.000(Ac.)
 Total runoff = 3.204(CFS) Total area = 1.600(Ac.)
 Street flow at end of street = 3.204(CFS)
 Half street flow at end of street = 3.204(CFS)
 Depth of flow = 0.388(Ft.), Average velocity = 2.498(Ft/s)
 Flow width (from curb towards crown)= 9.788(Ft.)

++++++
 Process from Point/Station 103.000 to Point/Station 106.000
 ***** IRREGULAR CHANNEL FLOW TRAVEL TIME *****

Estimated mean flow rate at midpoint of channel = 6.383(CFS)
 Depth of flow = 0.534(Ft.), Average velocity = 2.238(Ft/s)
 ***** Irregular Channel Data *****

Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 1.00
 2 12.00 0.00
 3 20.00 1.00
 Manning's 'N' friction factor = 0.030

Sub-Channel flow = 6.383(CFS)
 ' flow top width = 10.680(Ft.)
 ' velocity= 2.238(Ft/s)
 ' area = 2.852(Sq.Ft)
 ' Froude number = 0.763

Upstream point elevation = 1527.000(Ft.)
 Downstream point elevation = 1511.300(Ft.)
 Flow length = 1313.000(Ft.)
 Travel time = 9.78 min.
 Time of concentration = 31.38 min.
 Depth of flow = 0.534(Ft.)
 Average velocity = 2.238(Ft/s)
 Total irregular channel flow = 6.383(CFS)
 Irregular channel normal depth above invert elev. = 0.534(Ft.)
 Average velocity of channel(s) = 2.238(Ft/s)
 Adding area flow to channel
 USER INPUT of soil data for subarea
 Runoff Coefficient = 0.688

```

Decimal fraction soil group A = 0.570
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.430
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 67.64
Pervious area fraction = 0.850; Impervious fraction = 0.150
Rainfall intensity = 1.659(In/Hr) for a 100.0 year storm
Subarea runoff = 6.276(CFS) for 5.500(Ac.)
Total runoff = 9.479(CFS) Total area = 7.100(Ac.)
Depth of flow = 0.619(Ft.), Average velocity = 2.471(Ft/s)

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+++++
Process from Point/Station 103.000 to Point/Station 106.000
**** CONFLUENCE OF MAIN STREAMS ****

```

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 7.100(Ac.)
Runoff from this stream = 9.479(CFS)
Time of concentration = 31.38 min.
Rainfall intensity = 1.659(In/Hr)
Program is now starting with Main Stream No. 2

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+++++
Process from Point/Station 104.000 to Point/Station 105.000
**** INITIAL AREA EVALUATION ****

```

Initial area flow distance = 647.000(Ft.)
Top (of initial area) elevation = 1530.800(Ft.)
Bottom (of initial area) elevation = 1520.300(Ft.)
Difference in elevation = 10.500(Ft.)
Slope = 0.01623 s(percent)= 1.62
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 16.091 min.
Rainfall intensity = 2.317(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.738
Decimal fraction soil group A = 0.720
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.280
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 72.32
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 7.520(CFS)
Total initial stream area = 4.400(Ac.)
Pervious area fraction = 1.000

```

+++++
Process from Point/Station 105.000 to Point/Station 106.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

```

Estimated mean flow rate at midpoint of channel = 9.642(CFS)
Depth of flow = 0.631(Ft.), Average velocity = 2.424(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 1.00
2 12.00 0.00
3 20.00 1.00

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 9.642(CFS)
' flow top width = 12.613(Ft.)
' velocity= 2.424(Ft/s)
' area = 3.978(Sq.Ft)
' Froude number = 0.761

Upstream point elevation = 1520.300(Ft.)
 Downstream point elevation = 1511.300(Ft.)
 Flow length = 801.000(Ft.)
 Travel time = 5.51 min.
 Time of concentration = 21.60 min.
 Depth of flow = 0.631(Ft.)
 Average velocity = 2.424(Ft/s)
 Total irregular channel flow = 9.642(CFS)
 Irregular channel normal depth above invert elev. = 0.631(Ft.)
 Average velocity of channel(s) = 2.424(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (poor cover) subarea
 Runoff Coefficient = 0.803
 Decimal fraction soil group A = 0.070
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.930
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 84.67
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 2.000(In/Hr) for a 100.0 year storm
 Subarea runoff = 4.176(CFS) for 2.600(Ac.)
 Total runoff = 11.696(CFS) Total area = 7.000(Ac.)
 Depth of flow = 0.678(Ft.), Average velocity = 2.544(Ft/s)

++++++
 Process from Point/Station 105.000 to Point/Station 106.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 7.000(Ac.)
 Runoff from this stream = 11.696(CFS)
 Time of concentration = 21.60 min.
 Rainfall intensity = 2.000(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	9.479	31.38	1.659
2	11.696	21.60	2.000

Largest stream flow has longer or shorter time of concentration

$$\begin{aligned}
 Q_p &= 11.696 + \text{sum of} \\
 &\quad Q_a \quad Tb/Ta \\
 &\quad 9.479 * 0.688 = 6.525 \\
 Q_p &= 18.222
 \end{aligned}$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

$$9.479 \quad 11.696$$

Area of streams before confluence:

$$7.100 \quad 7.000$$

Results of confluence:

Total flow rate = 18.222(CFS)
 Time of concentration = 21.598 min.
 Effective stream area after confluence = 14.100(Ac.)
 End of computations, total study area = 14.10 (Ac.)
 The following figures may

be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.839
 Area averaged RI index number = 71.0

APPENDIX A.2: AREA “A” – 10-YEAR STORM EVENT

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 07/28/17 File:ARAEX10.out

250.02.16

10-YEAR RATIONAL TABLING METHOD FOR AREA A

EXISTING CONDITION

FN: ARAEX10.RRV

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 6279

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.450(In.)
100 year, 1 hour precipitation = 1.200(In.)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.759(In/Hr)
Slope of intensity duration curve = 0.5000

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 939.000(Ft.)
Top (of initial area) elevation = 1553.700(Ft.)
Bottom (of initial area) elevation = 1542.000(Ft.)
Difference in elevation = 11.700(Ft.)
Slope = 0.01246 s(percent)= 1.25
 $TC = k(0.300)*[(length^3)/(elevation change)]^{0.2}$
Initial area time of concentration = 11.145 min.
Rainfall intensity = 1.760(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.926(CFS)
Total initial stream area = 0.600(Ac.)
Pervious area fraction = 0.100

+++++
Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1542.000(Ft.)
End of street segment elevation = 1527.000(Ft.)
Length of street segment = 1489.000(Ft.)

Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.053
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 2.000(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 1.489(CFS)
 Depth of flow = 0.309(Ft.), Average velocity = 2.255(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 5.792(Ft.)
 Flow velocity = 2.26(Ft/s)
 Travel time = 11.00 min. TC = 22.15 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.853
 Decimal fraction soil group A = 0.530
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.470
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 49.39
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 1.249(In/Hr) for a 10.0 year storm
 Subareal runoff = 1.065(CFS) for 1.000(Ac.)
 Total runoff = 1.991(CFS) Total area = 1.600(Ac.)
 Street flow at end of street = 1.991(CFS)
 Half street flow at end of street = 1.991(CFS)
 Depth of flow = 0.339(Ft.), Average velocity = 2.313(Ft/s)
 Flow width (from curb towards crown)= 7.322(Ft.)

 Process from Point/Station 103.000 to Point/Station 106.000
 ***** IRREGULAR CHANNEL FLOW TRAVEL TIME *****

Estimated mean flow rate at midpoint of channel = 3.715(CFS)
 Depth of flow = 0.436(Ft.), Average velocity = 1.955(Ft/s)
 ***** Irregular Channel Data *****

Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 1.00
 2 12.00 0.00
 3 20.00 1.00

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 3.715(CFS)
 ' flow top width = 8.719(Ft.)
 ' velocity= 1.955(Ft/s)
 ' area = 1.900(Sq.Ft)
 ' Froude number = 0.738

Upstream point elevation = 1527.000(Ft.)
 Downstream point elevation = 1511.300(Ft.)
 Flow length = 1313.000(Ft.)
 Travel time = 11.19 min.
 Time of concentration = 33.34 min.
 Depth of flow = 0.436(Ft.)
 Average velocity = 1.955(Ft/s)
 Total irregular channel flow = 3.715(CFS)
 Irregular channel normal depth above invert elev. = 0.436(Ft.)
 Average velocity of channel(s) = 1.955(Ft/s)
 Adding area flow to channel
 USER INPUT of soil data for subarea
 Runoff Coefficient = 0.605

Decimal fraction soil group A = 0.570
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.430
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 67.64
 Pervious area fraction = 0.850; Impervious fraction = 0.150
 Rainfall intensity = 1.018(In/Hr) for a 10.0 year storm
 Subarea runoff = 3.387(CFS) for 5.500(Ac.)
 Total runoff = 5.379(CFS) Total area = 7.100(Ac.)
 Depth of flow = 0.501(Ft.), Average velocity = 2.144(Ft/s)

++++++
 Process from Point/Station 103.000 to Point/Station 106.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 7.100(Ac.)
 Runoff from this stream = 5.379(CFS)
 Time of concentration = 33.34 min.
 Rainfall intensity = 1.018(In/Hr)
 Program is now starting with Main Stream No. 2

++++++
 Process from Point/Station 104.000 to Point/Station 105.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 647.000(Ft.)
 Top (of initial area) elevation = 1530.800(Ft.)
 Bottom (of initial area) elevation = 1520.300(Ft.)
 Difference in elevation = 10.500(Ft.)
 Slope = 0.01623 s(percent)= 1.62
 $TC = k(0.530)*[(length^3)/(elevation change)]^{0.2}$
 Initial area time of concentration = 16.091 min.
 Rainfall intensity = 1.465(In/Hr) for a 10.0 year storm
 UNDEVELOPED (poor cover) subarea
 Runoff Coefficient = 0.667
 Decimal fraction soil group A = 0.720
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.280
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 72.32
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Initial subarea runoff = 4.302(CFS)
 Total initial stream area = 4.400(Ac.)
 Pervious area fraction = 1.000

++++++
 Process from Point/Station 105.000 to Point/Station 106.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 5.545(CFS)
 Depth of flow = 0.513(Ft.), Average velocity = 2.111(Ft/s)
 ***** Irregular Channel Data *****

Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 1.00
 2 12.00 0.00
 3 20.00 1.00

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 5.545(CFS)
 ' flow top width = 10.250(Ft.)
 ' velocity= 2.111(Ft/s)
 ' area = 2.627(Sq.Ft)
 ' Froude number = 0.735

Upstream point elevation = 1520.300(Ft.)
 Downstream point elevation = 1511.300(Ft.)
 Flow length = 801.000(Ft.)
 Travel time = 6.32 min.
 Time of concentration = 22.41 min.
 Depth of flow = 0.513(Ft.)
 Average velocity = 2.111(Ft/s)
 Total irregular channel flow = 5.545(CFS)
 Irregular channel normal depth above invert elev. = 0.513(Ft.)
 Average velocity of channel(s) = 2.111(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (poor cover) subarea
 Runoff Coefficient = 0.753
 Decimal fraction soil group A = 0.070
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.930
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 84.67
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 1.241(In/Hr) for a 10.0 year storm
 Subarea runoff = 2.431(CFS) for 2.600(Ac.)
 Total runoff = 6.733(CFS) Total area = 7.000(Ac.)
 Depth of flow = 0.551(Ft.), Average velocity = 2.216(Ft/s)

++++++
 Process from Point/Station 105.000 to Point/Station 106.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 7.000(Ac.)
 Runoff from this stream = 6.733(CFS)
 Time of concentration = 22.41 min.
 Rainfall intensity = 1.241(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	5.379	33.34	1.018
2	6.733	22.41	1.241

Largest stream flow has longer or shorter time of concentration

$$Q_p = 6.733 + \text{sum of } Q_a \cdot \frac{T_b}{T_a}$$

$$5.379 * 0.672 = 3.616$$

$$Q_p = 10.349$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

$$5.379 \quad 6.733$$

Area of streams before confluence:

$$7.100 \quad 7.000$$

Results of confluence:

Total flow rate = 10.349(CFS)
 Time of concentration = 22.415 min.
 Effective stream area after confluence = 14.100(Ac.)
 End of computations, total study area = 14.10 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.839
 Area averaged RI index number = 71.0

APPENDIX B: POST-PROJECT CONDITION RATIONAL METHOD HYDROLOGY

APPENDIX B.1: AREA “A” – 100-YEAR STORM EVENT

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 01/26/18 File:ARAP100.out

250.02.16

100-YEAR RATIONAL TABLING METHOD FOR AREA A
POST-PROJECT CONDITION
FN: ARAP100.RRV

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 6279

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.450(In.)
100 year, 1 hour precipitation = 1.200(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.200(In/Hr)
Slope of intensity duration curve = 0.5000

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 939.000(Ft.)
Top (of initial area) elevation = 1553.700(Ft.)
Bottom (of initial area) elevation = 1542.000(Ft.)
Difference in elevation = 11.700(Ft.)
Slope = 0.01246 s(percent)= 1.25
 $TC = k(0.300)*[(length^3)/(elevation change)]^{0.2}$
Initial area time of concentration = 11.145 min.
Rainfall intensity = 2.784(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.477(CFS)
Total initial stream area = 0.600(Ac.)
Pervious area fraction = 0.100

+++++
Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1542.000(Ft.)
End of street segment elevation = 1526.000(Ft.)
Length of street segment = 1501.000(Ft.)

Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 57.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 12.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 2.000(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 3.323(CFS)
 Depth of flow = 0.348(Ft.), Average velocity = 2.463(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 11.055(Ft.)
 Flow velocity = 2.46(Ft/s)
 Travel time = 10.16 min. TC = 21.30 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.860
 Decimal fraction soil group A = 0.640
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.360
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 45.32
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 2.014(In/Hr) for a 100.0 year storm
 Subareal runoff = 3.637(CFS) for 2.100(Ac.)
 Total runoff = 5.114(CFS) Total area = 2.700(Ac.)
 Street flow at end of street = 5.114(CFS)
 Half street flow at end of street = 5.114(CFS)
 Depth of flow = 0.391(Ft.), Average velocity = 2.727(Ft/s)
 Flow width (from curb towards crown)= 13.225(Ft.)

++++++
 Process from Point/Station 103.000 to Point/Station 104.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1522.000(Ft.)
 Downstream point/station elevation = 1518.000(Ft.)
 Pipe length = 70.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.114(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 5.114(CFS)
 Normal flow depth in pipe = 6.70(In.)
 Flow top width inside pipe = 11.92(In.)
 Critical Depth = 11.07(In.)
 Pipe flow velocity = 11.34(Ft/s)
 Travel time through pipe = 0.10 min.
 Time of concentration (TC) = 21.40 min.

++++++
 Process from Point/Station 103.000 to Point/Station 104.000
 *** SUBAREA FLOW ADDITION ***

COMMERCIAL subarea type
 Runoff Coefficient = 0.847
 Decimal fraction soil group A = 1.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 32.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 21.40 min.
 Rainfall intensity = 2.009(In/Hr) for a 100.0 year storm
 Subarea runoff = 1.362(CFS) for 0.800(Ac.)
 Total runoff = 6.476(CFS) Total area = 3.500(Ac.)

Process from Point/Station 104.000 to Point/Station 107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1516.100(Ft.)
Downstream point/station elevation = 1513.700(Ft.)
Pipe length = 485.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.476(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 6.476(CFS)
Normal flow depth in pipe = 13.05(In.)
Flow top width inside pipe = 16.07(In.)
Critical Depth = 11.81(In.)
Pipe flow velocity = 4.71(Ft/s)
Travel time through pipe = 1.71 min.
Time of concentration (TC) = 23.12 min.

Process from Point/Station 104.000 to Point/Station 107.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 3.500(Ac.)
Runoff from this stream = 6.476(CFS)
Time of concentration = 23.12 min.
Rainfall intensity = 1.933(In/Hr)

Process from Point/Station 105.000 to Point/Station 106.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 684.000(Ft.)
Top (of initial area) elevation = 1525.400(Ft.)
Bottom (of initial area) elevation = 1520.000(Ft.)
Difference in elevation = 5.400(Ft.)
Slope = 0.00789 s(percent) = 0.79
TC = $k(0.300)*[(length^3)/(elevation change)]^{0.2}$
Initial area time of concentration = 10.757 min.
Rainfall intensity = 2.834(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.862
Decimal fraction soil group A = 0.820
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.180
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 38.66
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 3.907(CFS)
Total initial stream area = 1.600(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 106.000 to Point/Station 107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1516.000(Ft.)
Downstream point/station elevation = 1513.700(Ft.)
Pipe length = 42.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.907(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 3.907(CFS)
Normal flow depth in pipe = 5.78(In.)
Flow top width inside pipe = 11.99(In.)
Critical Depth = 10.07(In.)
Pipe flow velocity = 10.44(Ft/s)
Travel time through pipe = 0.07 min.

Time of concentration (TC) = 10.82 min.

+++++
Process from Point/Station 106.000 to Point/Station 107.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2

Stream flow area = 1.600(Ac.)
Runoff from this stream = 3.907(CFS)
Time of concentration = 10.82 min.
Rainfall intensity = 2.825(In/Hr)

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	6.476	23.12	1.933
2	3.907	10.82	2.825

Largest stream flow has longer time of concentration

$Q_p = 6.476 + \text{sum of } Q_b$
 $Q_b = I_a/I_b$
 $3.907 * 0.684 = 2.673$

$Q_p = 9.149$

Total of 2 streams to confluence:

Flow rates before confluence point:
6.476 3.907

Area of streams before confluence:
3.500 1.600

Results of confluence:

Total flow rate = 9.149(CFS)
Time of concentration = 23.118 min.
Effective stream area after confluence = 5.100(Ac.)

+++++
Process from Point/Station 107.000 to Point/Station 112.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1513.700(Ft.)
Downstream point/station elevation = 1513.200(Ft.)
Pipe length = 101.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.149(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 9.149(CFS)
Normal flow depth in pipe = 14.48(In.)
Flow top width inside pipe = 19.43(In.)
Critical Depth = 13.50(In.)
Pipe flow velocity = 5.17(Ft/s)
Travel time through pipe = 0.33 min.
Time of concentration (TC) = 23.44 min.

+++++
Process from Point/Station 107.000 to Point/Station 112.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 5.100(Ac.)
Runoff from this stream = 9.149(CFS)
Time of concentration = 23.44 min.
Rainfall intensity = 1.920(In/Hr)
Program is now starting with Main Stream No. 2

+++++
Process from Point/Station 108.000 to Point/Station 109.000
**** INITIAL AREA EVALUATION ****

```
Initial area flow distance = 336.000(Ft.)
Top (of initial area) elevation = 1528.300(Ft.)
Bottom (of initial area) elevation = 1522.500(Ft.)
Difference in elevation = 5.800(Ft.)
Slope = 0.01726 s(percent)= 1.73
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.922 min.
Rainfall intensity = 3.533(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.871
Decimal fraction soil group A = 0.670
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.330
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 44.21
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.923(CFS)
Total initial stream area = 0.300(Ac.)
Pervious area fraction = 0.100
```

```
+++++
Process from Point/Station 109.000 to Point/Station 111.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation = 1519.400(Ft.)
Downstream point/station elevation = 1518.000(Ft.)
Pipe length = 276.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.923(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 0.923(CFS)
Normal flow depth in pipe = 6.00(In.)
Flow top width inside pipe = 8.49(In.)
Critical Depth = 5.28(In.)
Pipe flow velocity = 2.95(Ft/s)
Travel time through pipe = 1.56 min.
Time of concentration (TC) = 8.48 min.
```

```
+++++
Process from Point/Station 109.000 to Point/Station 111.000
**** SUBAREA FLOW ADDITION ****
```

```
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.580
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 47.54
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 8.48 min.
Rainfall intensity = 3.192(In/Hr) for a 100.0 year storm
Subarea runoff = 8.068(CFS) for 2.900(Ac.)
Total runoff = 8.991(CFS) Total area = 3.200(Ac.)
```

```
+++++
Process from Point/Station 109.000 to Point/Station 111.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.200(Ac.)
Runoff from this stream = 8.991(CFS)
Time of concentration = 8.48 min.
Rainfall intensity = 3.192(In/Hr)
```

```
+++++
Process from Point/Station 110.000 to Point/Station 111.000
```

**** INITIAL AREA EVALUATION ****

```
Initial area flow distance = 331.000(Ft.)
Top (of initial area) elevation = 1523.000(Ft.)
Bottom (of initial area) elevation = 1518.000(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.01511 s(percent) = 1.51
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.067 min.
Rainfall intensity = 3.497(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.930(CFS)
Total initial stream area = 0.300(Ac.)
Pervious area fraction = 0.100
```

```
+++++
Process from Point/Station 110.000 to Point/Station 111.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 0.300(Ac.)
Runoff from this stream = 0.930(CFS)
Time of concentration = 7.07 min.
Rainfall intensity = 3.497(In/Hr)
Summary of stream data:
```

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	8.991	8.48	3.192
2	0.930	7.07	3.497

Largest stream flow has longer time of concentration
Q_p = 8.991 + sum of
Q_b I_a/I_b
0.930 * 0.913 = 0.849
Q_p = 9.840

Total of 2 streams to confluence:
Flow rates before confluence point:
8.991 0.930
Area of streams before confluence:
3.200 0.300
Results of confluence:
Total flow rate = 9.840(CFS)
Time of concentration = 8.480 min.
Effective stream area after confluence = 3.500(Ac.)

```
+++++
Process from Point/Station 111.000 to Point/Station 112.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation = 1513.500(Ft.)
Downstream point/station elevation = 1513.200(Ft.)
Pipe length = 44.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.840(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 9.840(CFS)
Normal flow depth in pipe = 13.59(In.)
Flow top width inside pipe = 20.07(In.)
Critical Depth = 14.01(In.)
Pipe flow velocity = 5.97(Ft/s)
```

Travel time through pipe = 0.12 min.
Time of concentration (TC) = 8.60 min.

+++++
Process from Point/Station 111.000 to Point/Station 112.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 3.500(Ac.)
Runoff from this stream = 9.840(CFS)
Time of concentration = 8.60 min.
Rainfall intensity = 3.169(In/Hr)

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	9.149	23.44	1.920
2	9.840	8.60	3.169

Largest stream flow has longer or shorter time of concentration

$$Q_p = 9.840 + \text{sum of } Q_a \\ Q_a = \frac{T_b}{T_a} \\ 9.149 * 0.367 = 3.358$$

$$Q_p = 13.198$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

$$9.149 \quad 9.840$$

Area of streams before confluence:

$$5.100 \quad 3.500$$

Results of confluence:

Total flow rate = 13.198(CFS)
Time of concentration = 8.603 min.
Effective stream area after confluence = 8.600(Ac.)

+++++
Process from Point/Station 112.000 to Point/Station 115.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1513.200(Ft.)
Downstream point/station elevation = 1513.100(Ft.)
Pipe length = 32.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 13.198(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 13.198(CFS)
Normal flow depth in pipe = 20.77(In.)
Flow top width inside pipe = 16.39(In.)
Critical Depth = 15.69(In.)
Pipe flow velocity = 4.57(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 8.72 min.

+++++
Process from Point/Station 112.000 to Point/Station 115.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 8.600(Ac.)
Runoff from this stream = 13.198(CFS)
Time of concentration = 8.72 min.
Rainfall intensity = 3.148(In/Hr)

+++++

Process from Point/Station 113.000 to Point/Station 114.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 727.000(Ft.)
Top (of initial area) elevation = 1530.700(Ft.)
Bottom (of initial area) elevation = 1519.000(Ft.)
Difference in elevation = 11.700(Ft.)
Slope = 0.01609 s(percent)= 1.61
TC = $k(0.530)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 16.887 min.
Rainfall intensity = 2.262(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.748
Decimal fraction soil group A = 0.610
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.390
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 74.41
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 4.739(CFS)
Total initial stream area = 2.800(Ac.)
Pervious area fraction = 1.000

+++++
Process from Point/Station 114.000 to Point/Station 115.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1519.000(Ft.)
Downstream point/station elevation = 1513.100(Ft.)
Pipe length = 238.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.739(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 4.739(CFS)
Normal flow depth in pipe = 8.46(In.)
Flow top width inside pipe = 10.94(In.)
Critical Depth = 10.83(In.)
Pipe flow velocity = 8.01(Ft/s)
Travel time through pipe = 0.50 min.
Time of concentration (TC) = 17.38 min.

+++++
Process from Point/Station 114.000 to Point/Station 115.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 2.800(Ac.)
Runoff from this stream = 4.739(CFS)
Time of concentration = 17.38 min.
Rainfall intensity = 2.229(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	13.198	8.72	3.148
2	4.739	17.38	2.229

Largest stream flow has longer or shorter time of concentration

Qp = 13.198 + sum of
Qa Tb/Ta
4.739 * 0.502 = 2.377
Qp = 15.575

Total of 2 streams to confluence:
Flow rates before confluence point:

13.198 4.739

Area of streams before confluence:
8.600 2.800

Results of confluence:

Total flow rate = 15.575(CFS)
Time of concentration = 8.720 min.
Effective stream area after confluence = 11.400(Ac.)

+++++
Process from Point/Station 115.000 to Point/Station 116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1513.100(Ft.)
Downstream point/station elevation = 1513.000(Ft.)
Pipe length = 10.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 15.575(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 15.575(CFS)
Normal flow depth in pipe = 16.90(In.)
Flow top width inside pipe = 16.65(In.)
Critical Depth = 17.51(In.)
Pipe flow velocity = 7.51(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 8.74 min.

+++++
Process from Point/Station 115.000 to Point/Station 116.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 8.74 min.
Rainfall intensity = 3.144(In/Hr) for a 100.0 year storm
Subarea runoff = 0.278(CFS) for 0.100(Ac.)
Total runoff = 15.854(CFS) Total area = 11.500(Ac.)

+++++
Process from Point/Station 116.000 to Point/Station 118.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 18.129(CFS)
Depth of flow = 0.787(Ft.), Average velocity = 1.947(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 1.50
2 3.50 0.00
3 13.50 0.00
4 17.00 1.50

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 18.129(CFS)
' ' flow top width = 13.671(Ft.)
' ' velocity= 1.947(Ft/s)
' ' area = 9.312(Sq.Ft.)
' ' Froude number = 0.416

Upstream point elevation = 1513.000(Ft.)
Downstream point elevation = 1511.500(Ft.)
Flow length = 564.000(Ft.)
Travel time = 4.83 min.
Time of concentration = 13.57 min.
Depth of flow = 0.787(Ft.)
Average velocity = 1.947(Ft/s)
Total irregular channel flow = 18.129(CFS)

Irregular channel normal depth above invert elev. = 0.787(Ft.)
 Average velocity of channel(s) = 1.947(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (poor cover) subarea
 Runoff Coefficient = 0.829
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 86.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 2.523(In/Hr) for a 100.0 year storm
 Subarea runoff = 4.600(CFS) for 2.200(Ac.)
 Total runoff = 20.454(CFS) Total area = 13.700(Ac.)
 Depth of flow = 0.843(Ft.), Average velocity = 2.027(Ft/s)

++++++
 Process from Point/Station 116.000 to Point/Station 118.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 13.700(Ac.)
 Runoff from this stream = 20.454(CFS)
 Time of concentration = 13.57 min.
 Rainfall intensity = 2.523(In/Hr)

++++++
 Process from Point/Station 117.000 to Point/Station 118.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 654.000(Ft.)
 Top (of initial area) elevation = 1520.000(Ft.)
 Bottom (of initial area) elevation = 1511.500(Ft.)
 Difference in elevation = 8.500(Ft.)
 Slope = 0.01300 s(percent) = 1.30
 $TC = k(0.300)*[(length^3)/(elevation change)]^{0.2}$
 Initial area time of concentration = 9.563 min.
 Rainfall intensity = 3.006(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.885
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 2.394(CFS)
 Total initial stream area = 0.900(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 117.000 to Point/Station 118.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 0.900(Ac.)
 Runoff from this stream = 2.394(CFS)
 Time of concentration = 9.56 min.
 Rainfall intensity = 3.006(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	20.454	13.57	2.523
2	2.394	9.56	3.006

Largest stream flow has longer time of concentration

$Q_p = 20.454 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $2.394 * 0.839 = 2.010$
 $Q_p = 22.464$

Total of 2 streams to confluence:
Flow rates before confluence point:

20.454 2.394

Area of streams before confluence:
13.700 0.900

Results of confluence:

Total flow rate = 22.464(CFS)

Time of concentration = 13.570 min.

Effective stream area after confluence = 14.600(Ac.)

End of computations, total study area = 14.60 (Ac.)

The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.408

Area averaged RI index number = 59.1

APPENDIX B.2: AREA “A” – 10-YEAR STORM EVENT

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 01/26/18 File:ARAP10.out

250.02.16

10-YEAR RATIONAL TABLING METHOD FOR AREA A
POST-PROJECT CONDITION
FN: ARAP10.RRV

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 6279

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.450(In.)
100 year, 1 hour precipitation = 1.200(In.)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.759(In/Hr)
Slope of intensity duration curve = 0.5000

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 939.000(Ft.)
Top (of initial area) elevation = 1553.700(Ft.)
Bottom (of initial area) elevation = 1542.000(Ft.)
Difference in elevation = 11.700(Ft.)
Slope = 0.01246 s(percent)= 1.25
TC = $k(0.300)*[(length^3)/(elevation change)]^{0.2}$
Initial area time of concentration = 11.145 min.
Rainfall intensity = 1.760(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.926(CFS)
Total initial stream area = 0.600(Ac.)
Pervious area fraction = 0.100

+++++
Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1542.000(Ft.)
End of street segment elevation = 1526.000(Ft.)
Length of street segment = 1501.000(Ft.)

Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 57.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 12.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 2.000(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.067(CFS)
 Depth of flow = 0.306(Ft.), Average velocity = 2.211(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.991(Ft.)
 Flow velocity = 2.21(Ft/s)
 Travel time = 11.32 min. TC = 22.46 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.849
 Decimal fraction soil group A = 0.640
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.360
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 45.32
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 1.240(In/Hr) for a 10.0 year storm
 Subareal runoff = 2.211(CFS) for 2.100(Ac.)
 Total runoff = 3.137(CFS) Total area = 2.700(Ac.)
 Street flow at end of street = 3.137(CFS)
 Half street flow at end of street = 3.137(CFS)
 Depth of flow = 0.342(Ft.), Average velocity = 2.431(Ft/s)
 Flow width (from curb towards crown)= 10.788(Ft.)

++++++
 Process from Point/Station 103.000 to Point/Station 104.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1522.000(Ft.)
 Downstream point/station elevation = 1518.000(Ft.)
 Pipe length = 70.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.137(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 3.137(CFS)
 Normal flow depth in pipe = 6.05(In.)
 Flow top width inside pipe = 8.45(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 9.93(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 22.58 min.

++++++
 Process from Point/Station 103.000 to Point/Station 104.000
 *** SUBAREA FLOW ADDITION ***

COMMERCIAL subarea type
 Runoff Coefficient = 0.837
 Decimal fraction soil group A = 1.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 32.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 22.58 min.
 Rainfall intensity = 1.237(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.828(CFS) for 0.800(Ac.)
 Total runoff = 3.965(CFS) Total area = 3.500(Ac.)

Process from Point/Station 104.000 to Point/Station 107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1516.100(Ft.)
Downstream point/station elevation = 1513.700(Ft.)
Pipe length = 485.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.965(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 3.965(CFS)
Normal flow depth in pipe = 10.85(In.)
Flow top width inside pipe = 13.42(In.)
Critical Depth = 9.67(In.)
Pipe flow velocity = 4.17(Ft/s)
Travel time through pipe = 1.94 min.
Time of concentration (TC) = 24.52 min.

Process from Point/Station 104.000 to Point/Station 107.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 3.500(Ac.)
Runoff from this stream = 3.965(CFS)
Time of concentration = 24.52 min.
Rainfall intensity = 1.187(In/Hr)

Process from Point/Station 105.000 to Point/Station 106.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 684.000(Ft.)
Top (of initial area) elevation = 1525.400(Ft.)
Bottom (of initial area) elevation = 1520.000(Ft.)
Difference in elevation = 5.400(Ft.)
Slope = 0.00789 s(percent) = 0.79
TC = $k(0.300)*[(length^3)/(elevation change)]^{0.2}$
Initial area time of concentration = 10.757 min.
Rainfall intensity = 1.792(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.851
Decimal fraction soil group A = 0.820
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.180
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 38.66
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 2.440(CFS)
Total initial stream area = 1.600(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 106.000 to Point/Station 107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1516.000(Ft.)
Downstream point/station elevation = 1513.700(Ft.)
Pipe length = 42.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.440(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.440(CFS)
Normal flow depth in pipe = 5.18(In.)
Flow top width inside pipe = 8.90(In.)
Critical Depth = 8.25(In.)
Pipe flow velocity = 9.26(Ft/s)
Travel time through pipe = 0.08 min.

Time of concentration (TC) = 10.83 min.

+++++
Process from Point/Station 106.000 to Point/Station 107.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2

Stream flow area = 1.600(Ac.)
Runoff from this stream = 2.440(CFS)
Time of concentration = 10.83 min.
Rainfall intensity = 1.785(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	3.965	24.52	1.187
2	2.440	10.83	1.785

Largest stream flow has longer time of concentration

$Q_p = 3.965 + \text{sum of } Q_b$
 $Q_b = I_a/I_b$
 $2.440 * 0.665 = 1.622$
 $Q_p = 5.587$

Total of 2 streams to confluence:

Flow rates before confluence point:
3.965 2.440

Area of streams before confluence:
3.500 1.600

Results of confluence:

Total flow rate = 5.587(CFS)
Time of concentration = 24.516 min.
Effective stream area after confluence = 5.100(Ac.)

+++++
Process from Point/Station 107.000 to Point/Station 112.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1513.700(Ft.)
Downstream point/station elevation = 1513.200(Ft.)
Pipe length = 101.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.587(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 5.587(CFS)
Normal flow depth in pipe = 11.70(In.)
Flow top width inside pipe = 17.17(In.)
Critical Depth = 10.94(In.)
Pipe flow velocity = 4.60(Ft/s)
Travel time through pipe = 0.37 min.
Time of concentration (TC) = 24.88 min.

+++++
Process from Point/Station 107.000 to Point/Station 112.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 5.100(Ac.)
Runoff from this stream = 5.587(CFS)
Time of concentration = 24.88 min.
Rainfall intensity = 1.178(In/Hr)
Program is now starting with Main Stream No. 2

+++++
Process from Point/Station 108.000 to Point/Station 109.000
**** INITIAL AREA EVALUATION ****

```
Initial area flow distance = 336.000(Ft.)
Top (of initial area) elevation = 1528.300(Ft.)
Bottom (of initial area) elevation = 1522.500(Ft.)
Difference in elevation = 5.800(Ft.)
Slope = 0.01726 s(percent)= 1.73
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.922 min.
Rainfall intensity = 2.233(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.670
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.330
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 44.21
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.577(CFS)
Total initial stream area = 0.300(Ac.)
Pervious area fraction = 0.100
```

```
+++++
Process from Point/Station 109.000 to Point/Station 111.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation = 1519.400(Ft.)
Downstream point/station elevation = 1518.000(Ft.)
Pipe length = 276.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.577(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 0.577(CFS)
Normal flow depth in pipe = 4.44(In.)
Flow top width inside pipe = 9.00(In.)
Critical Depth = 4.13(In.)
Pipe flow velocity = 2.65(Ft/s)
Travel time through pipe = 1.73 min.
Time of concentration (TC) = 8.66 min.
```

```
+++++
Process from Point/Station 109.000 to Point/Station 111.000
**** SUBAREA FLOW ADDITION ****
```

```
COMMERCIAL subarea type
Runoff Coefficient = 0.862
Decimal fraction soil group A = 0.580
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 47.54
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 8.66 min.
Rainfall intensity = 1.997(In/Hr) for a 10.0 year storm
Subarea runoff = 4.991(CFS) for 2.900(Ac.)
Total runoff = 5.568(CFS) Total area = 3.200(Ac.)
```

```
+++++
Process from Point/Station 109.000 to Point/Station 111.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.200(Ac.)
Runoff from this stream = 5.568(CFS)
Time of concentration = 8.66 min.
Rainfall intensity = 1.997(In/Hr)
```

```
+++++
Process from Point/Station 110.000 to Point/Station 111.000
```

**** INITIAL AREA EVALUATION ****

```
Initial area flow distance = 331.000(Ft.)
Top (of initial area) elevation = 1523.000(Ft.)
Bottom (of initial area) elevation = 1518.000(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.01511 s(percent) = 1.51
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.067 min.
Rainfall intensity = 2.210(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.881
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.584(CFS)
Total initial stream area = 0.300(Ac.)
Pervious area fraction = 0.100
```

```
+++++++++++++++++++++++++++++
Process from Point/Station 110.000 to Point/Station 111.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 0.300(Ac.)
Runoff from this stream = 0.584(CFS)
Time of concentration = 7.07 min.
Rainfall intensity = 2.210(In/Hr)
Summary of stream data:
```

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	5.568	8.66	1.997
2	0.584	7.07	2.210

Largest stream flow has longer time of concentration

$Q_p = 5.568 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $0.584 * 0.904 = 0.528$

$Q_p = 6.096$

Total of 2 streams to confluence:

Flow rates before confluence point:

5.568 0.584

Area of streams before confluence:

3.200 0.300

Results of confluence:

Total flow rate = 6.096(CFS)
Time of concentration = 8.657 min.
Effective stream area after confluence = 3.500(Ac.)

```
+++++++++++++++++++++++++++++
Process from Point/Station 111.000 to Point/Station 112.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation = 1513.500(Ft.)
Downstream point/station elevation = 1513.200(Ft.)
Pipe length = 44.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.096(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 6.096(CFS)
Normal flow depth in pipe = 11.13(In.)
Flow top width inside pipe = 17.49(In.)
Critical Depth = 11.45(In.)
Pipe flow velocity = 5.32(Ft/s)
```

Travel time through pipe = 0.14 min.
Time of concentration (TC) = 8.79 min.

+++++
Process from Point/Station 111.000 to Point/Station 112.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 3.500(Ac.)
Runoff from this stream = 6.096(CFS)
Time of concentration = 8.79 min.
Rainfall intensity = 1.981(In/Hr)

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	5.587	24.88	1.178
2	6.096	8.79	1.981

Largest stream flow has longer or shorter time of concentration

Qp = 6.096 + sum of
Qa Tb/Ta
5.587 * 0.353 = 1.975

Qp = 8.071

Total of 2 main streams to confluence:

Flow rates before confluence point:

5.587 6.096

Area of streams before confluence:

5.100 3.500

Results of confluence:

Total flow rate = 8.071(CFS)
Time of concentration = 8.795 min.
Effective stream area after confluence = 8.600(Ac.)

+++++
Process from Point/Station 112.000 to Point/Station 115.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1513.200(Ft.)
Downstream point/station elevation = 1513.100(Ft.)
Pipe length = 32.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.071(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 8.071(CFS)
Normal flow depth in pipe = 15.75(In.)
Flow top width inside pipe = 18.19(In.)
Critical Depth = 12.65(In.)
Pipe flow velocity = 4.17(Ft/s)
Travel time through pipe = 0.13 min.
Time of concentration (TC) = 8.92 min.

+++++
Process from Point/Station 112.000 to Point/Station 115.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 8.600(Ac.)
Runoff from this stream = 8.071(CFS)
Time of concentration = 8.92 min.
Rainfall intensity = 1.967(In/Hr)

+++++

Process from Point/Station 113.000 to Point/Station 114.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 727.000(Ft.)
Top (of initial area) elevation = 1530.700(Ft.)
Bottom (of initial area) elevation = 1519.000(Ft.)
Difference in elevation = 11.700(Ft.)
Slope = 0.01609 s(percent)= 1.61
TC = $k(0.530)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 16.887 min.
Rainfall intensity = 1.430(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.681
Decimal fraction soil group A = 0.610
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.390
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 74.41
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 2.728(CFS)
Total initial stream area = 2.800(Ac.)
Pervious area fraction = 1.000

+++++
Process from Point/Station 114.000 to Point/Station 115.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1519.000(Ft.)
Downstream point/station elevation = 1513.100(Ft.)
Pipe length = 238.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.728(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 2.728(CFS)
Normal flow depth in pipe = 5.91(In.)
Flow top width inside pipe = 12.00(In.)
Critical Depth = 8.50(In.)
Pipe flow velocity = 7.09(Ft/s)
Travel time through pipe = 0.56 min.
Time of concentration (TC) = 17.45 min.

+++++
Process from Point/Station 114.000 to Point/Station 115.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 2.800(Ac.)
Runoff from this stream = 2.728(CFS)
Time of concentration = 17.45 min.
Rainfall intensity = 1.407(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	8.071	8.92	1.967
2	2.728	17.45	1.407

Largest stream flow has longer or shorter time of concentration

Qp = 8.071 + sum of
Qa Tb/Ta
2.728 * 0.511 = 1.395
Qp = 9.466

Total of 2 streams to confluence:

Flow rates before confluence point:

8.071 2.728

Area of streams before confluence:

8.600 2.800

Results of confluence:

Total flow rate = 9.466(CFS)
Time of concentration = 8.922 min.
Effective stream area after confluence = 11.400(Ac.)

+++++
Process from Point/Station 115.000 to Point/Station 116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1513.100(Ft.)
Downstream point/station elevation = 1513.000(Ft.)
Pipe length = 10.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.466(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 9.466(CFS)
Normal flow depth in pipe = 13.36(In.)
Flow top width inside pipe = 15.75(In.)
Critical Depth = 14.26(In.)
Pipe flow velocity = 6.73(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 8.95 min.

+++++
Process from Point/Station 115.000 to Point/Station 116.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 8.95 min.
Rainfall intensity = 1.964(In/Hr) for a 10.0 year storm
Subarea runoff = 0.173(CFS) for 0.100(Ac.)
Total runoff = 9.639(CFS) Total area = 11.500(Ac.)

+++++
Process from Point/Station 116.000 to Point/Station 118.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 10.942(CFS)
Depth of flow = 0.587(Ft.), Average velocity = 1.640(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 1.50
2 3.50 0.00
3 13.50 0.00
4 17.00 1.50

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 10.942(CFS)
' ' flow top width = 12.739(Ft.)
' ' velocity= 1.640(Ft/s)
' ' area = 6.674(Sq.Ft.)
' ' Froude number = 0.399

Upstream point elevation = 1513.000(Ft.)
Downstream point elevation = 1511.500(Ft.)
Flow length = 564.000(Ft.)
Travel time = 5.73 min.
Time of concentration = 14.68 min.
Depth of flow = 0.587(Ft.)
Average velocity = 1.640(Ft/s)
Total irregular channel flow = 10.942(CFS)

Irregular channel normal depth above invert elev. = 0.587(Ft.)
 Average velocity of channel(s) = 1.640(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (poor cover) subarea
 Runoff Coefficient = 0.788
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 86.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 1.534(In/Hr) for a 10.0 year storm
 Subarea runoff = 2.660(CFS) for 2.200(Ac.)
 Total runoff = 12.299(CFS) Total area = 13.700(Ac.)
 Depth of flow = 0.628(Ft.), Average velocity = 1.707(Ft/s)

++++++
 Process from Point/Station 116.000 to Point/Station 118.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 13.700(Ac.)
 Runoff from this stream = 12.299(CFS)
 Time of concentration = 14.68 min.
 Rainfall intensity = 1.534(In/Hr)

++++++
 Process from Point/Station 117.000 to Point/Station 118.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 654.000(Ft.)
 Top (of initial area) elevation = 1520.000(Ft.)
 Bottom (of initial area) elevation = 1511.500(Ft.)
 Difference in elevation = 8.500(Ft.)
 Slope = 0.01300 s(percent) = 1.30
 $TC = k(0.300)*[(length^3)/(elevation change)]^{0.2}$
 Initial area time of concentration = 9.563 min.
 Rainfall intensity = 1.900(In/Hr) for a 10.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.878
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 1.502(CFS)
 Total initial stream area = 0.900(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 117.000 to Point/Station 118.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 0.900(Ac.)
 Runoff from this stream = 1.502(CFS)
 Time of concentration = 9.56 min.
 Rainfall intensity = 1.900(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	12.299	14.68	1.534
2	1.502	9.56	1.900

Largest stream flow has longer time of concentration

$Q_p = 12.299 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $1.502 * 0.807 = 1.212$
 $Q_p = 13.511$

Total of 2 streams to confluence:
Flow rates before confluence point:

12.299 1.502

Area of streams before confluence:
13.700 0.900

Results of confluence:

Total flow rate = 13.511(CFS)

Time of concentration = 14.681 min.

Effective stream area after confluence = 14.600(Ac.)

End of computations, total study area = 14.60 (Ac.)

The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.408

Area averaged RI index number = 59.1

**APPENDIX C: PRE-PROJECT CONDITION UNIT HYDROGRAPH HYDROLOGY
CALCULATIONS**

APPENDIX C.1: 2-YEAR STORM EVENT

1-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPRE12.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
EXISTING CONDITION
FN: ARAPRE

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areaal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(Ft.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.163 Hr.
Lag time = 9.75 Min.
25% of lag time = 2.44 Min.
40% of lag time = 3.90 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 0.45 5.17

100 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 1.20 13.80

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 0.450(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 0.450(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 0.450(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 71.00 0.161
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
71.0	52.2	0.550	0.161	0.470	1.000	0.470
						Sum (F) = 0.470

Area averaged mean soil loss (F) (In/Hr) = 0.470

Minimum soil loss rate ((In/Hr)) = 0.235
(for 24 hour storm duration)

Soil loss rate (decimal) = 0.771

Slope of intensity-duration curve for a 1 hour storm = 0.5000

Unit Hydrograph
VALLEY S-Curve

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
------------------------	---------------	----------------------	-----------------------

1	0.083	51.266	6.366	0.738
2	0.167	102.533	27.222	3.155
3	0.250	153.799	28.703	3.327
4	0.333	205.065	12.516	1.451
5	0.417	256.331	6.680	0.774
6	0.500	307.598	4.653	0.539
7	0.583	358.864	3.341	0.387
8	0.667	410.130	2.524	0.293
9	0.750	461.397	1.836	0.213
10	0.833	512.663	1.556	0.180
11	0.917	563.929	1.237	0.143
12	1.000	615.195	0.968	0.112
13	1.083	666.462	0.758	0.088
14	1.167	717.728	0.560	0.065
15	1.250	768.994	0.513	0.059
16	1.333	820.260	0.566	0.066
			Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit (Hr.)	Time Percent	Storm Rain (In/Hr)	Loss rate(In./Hr)	Effective (In/Hr)
			Max | Low	
1	0.08	4.20	0.227 (0.470)	0.175 0.052
2	0.17	4.30	0.232 (0.470)	0.179 0.053
3	0.25	5.00	0.270 (0.470)	0.208 0.062
4	0.33	5.00	0.270 (0.470)	0.208 0.062
5	0.42	5.80	0.313 (0.470)	0.242 0.072
6	0.50	6.50	0.351 (0.470)	0.271 0.080
7	0.58	7.40	0.400 (0.470)	0.308 0.091
8	0.67	8.60	0.464 (0.470)	0.358 0.106
9	0.75	12.30	0.664 (0.470)	0.470 (0.512) 0.194
10	0.83	29.10	1.571 (0.470)	0.470 (1.212) 1.101
11	0.92	6.80	0.367 (0.470)	0.283 0.084
12	1.00	5.00	0.270 (0.470)	0.208 0.062

(Loss Rate Not Used)

Sum = 100.0 Sum = 2.0

Flood volume = Effective rainfall 0.17(In)
times area 11.5(Ac.)/(1(In)/(Ft.)) = 0.2(Ac.Ft)

Total soil loss = 0.28(In)

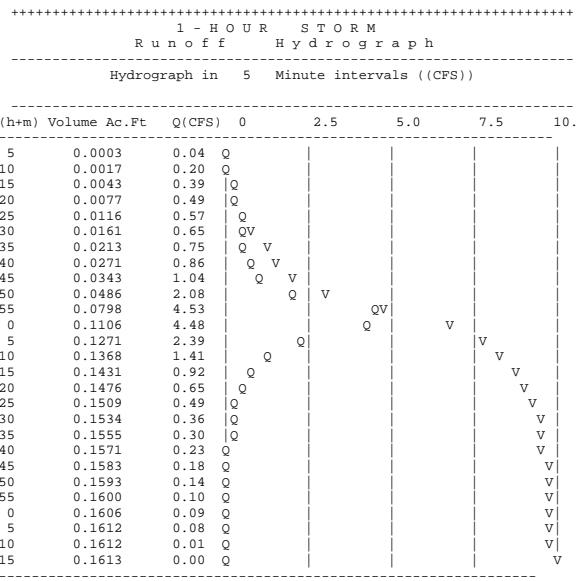
Total rainfall = 0.270(Ac.Ft)

Total rainfall = 0.45(In)

Flood volume = 7025.2 Cubic Feet

Total soil loss = 11758.1 Cubic Feet

Peak flow rate of this hydrograph = 4.529(CFS)



3-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPRE32.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16

UNIT HYDROGRAPH FOR AREA A

EXISTING CONDITION

FN: ARAPRE

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.

Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.

Length along longest watercourse = 3338.00(Ft.)

Length along longest watercourse measured to centroid = 1232.00(Ft.)

Length along longest watercourse = 0.632 Mi.

Length along longest watercourse measured to centroid = 0.233 Mi.

Difference in elevation = 34.70(Ft.)

Slope along watercourse = 54.8880 Ft./Mi.

Average Manning's 'N' = 0.030

Lag time = 0.163 Hr.

Lag time = 9.75 Min.

25% of lag time = 2.44 Min.

40% of lag time = 3.90 Min.

Unit time = 5.00 Min.

Duration of storm = 3 Hour(s)

User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	0.80	9.20

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.80	20.70

STORM EVENT (YEAR) = 2.00

Area Averaged 2-Year Rainfall = 0.800(In)

Area Averaged 100-Year Rainfall = 1.800(In)

Point rain (area averaged) = 0.800(In)

Areal adjustment factor = 99.99 %

Adjusted average point rain = 0.800(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.500	71.00	0.161

Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
71.0	52.2	0.550	0.161	0.470	1.000	0.470
					Sum (F)	0.470

Area averaged mean soil loss (F) (In/Hr) = 0.470

Minimum soil loss rate ((In/Hr)) = 0.235

(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.771

Unit Hydrograph VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1 0.083	51.266	6.366	0.738
2 0.167	102.533	27.222	3.155
3 0.250	153.799	28.703	3.327
4 0.333	205.065	12.516	1.451
5 0.417	256.331	6.680	0.774
6 0.500	307.598	4.653	0.539
7 0.583	358.864	3.341	0.387
8 0.667	410.130	2.524	0.293
9 0.750	461.397	1.836	0.213
10 0.833	512.663	1.556	0.180
11 0.917	563.929	1.237	0.143
12 1.000	615.195	0.968	0.112
13 1.083	666.462	0.758	0.088
14 1.167	717.728	0.560	0.065
15 1.250	768.994	0.513	0.059
16 1.333	820.260	0.566	0.066
		Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective
(Hr.)	Percent	(In/Hr)	Max | Low	(In/Hr)	
1 0.08	1.30	0.125	(0.470)	0.096	0.029
2 0.17	1.30	0.125	(0.470)	0.096	0.029
3 0.25	1.10	0.106	(0.470)	0.081	0.024
4 0.33	1.50	0.144	(0.470)	0.111	0.033
5 0.42	1.50	0.144	(0.470)	0.111	0.033
6 0.50	1.80	0.173	(0.470)	0.133	0.040
7 0.58	1.50	0.144	(0.470)	0.111	0.033
8 0.67	1.80	0.173	(0.470)	0.133	0.040
9 0.75	1.80	0.173	(0.470)	0.133	0.040
10 0.83	1.50	0.144	(0.470)	0.111	0.033
11 0.92	1.60	0.154	(0.470)	0.118	0.035
12 1.00	1.80	0.173	(0.470)	0.133	0.040
13 1.08	2.20	0.211	(0.470)	0.163	0.048
14 1.17	2.20	0.211	(0.470)	0.163	0.048
15 1.25	2.20	0.211	(0.470)	0.163	0.048
16 1.33	2.00	0.192	(0.470)	0.148	0.044
17 1.42	2.60	0.250	(0.470)	0.192	0.057
18 1.50	2.70	0.259	(0.470)	0.200	0.059
19 1.58	2.40	0.230	(0.470)	0.178	0.053
20 1.67	2.70	0.259	(0.470)	0.200	0.059
21 1.75	3.30	0.317	(0.470)	0.244	0.072
22 1.83	3.10	0.298	(0.470)	0.229	0.068
23 1.92	2.90	0.278	(0.470)	0.215	0.064
24 2.00	3.00	0.288	(0.470)	0.222	0.066
25 2.08	3.10	0.298	(0.470)	0.229	0.068
26 2.17	4.20	0.403	(0.470)	0.311	0.092

6-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPRE62.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16

UNIT HYDROGRAPH FOR AREA A

EXISTING CONDITION

FN: ARAPRE

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.

Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.

Length along longest watercourse = 3338.00(Ft.)

Length along longest watercourse measured to centroid = 1232.00(Ft.)

Length along longest watercourse = 0.632 Mi.

Length along longest watercourse measured to centroid = 0.233 Mi.

Difference in elevation = 34.70(Ft.)

Slope along watercourse = 54.8880 Ft./Mi.

Average Manning's 'N' = 0.030

Lag time = 0.163 Hr.

Lag time = 9.75 Min.

25% of lag time = 2.44 Min.

40% of lag time = 3.90 Min.

Unit time = 5.00 Min.

Duration of storm = 6 Hour(s)

User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.00	11.50

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	2.50	28.75

STORM EVENT (YEAR) = 2.00

Area Averaged 2-Year Rainfall = 1.000(In)

Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 1.000(In)

Areal adjustment factor = 100.00 %

Adjusted average point rain = 1.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.500	71.00	0.161

Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
71.0	52.2	0.550	0.161	0.470	1.000	0.470
					Sum (F)	0.470

Area averaged mean soil loss (F) (In/Hr) = 0.470

Minimum soil loss rate ((In/Hr)) = 0.235

(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.771

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	51.266	6.366	0.738
2	0.167	102.533	27.222	3.155
3	0.250	153.799	28.703	3.327
4	0.333	205.065	12.516	1.451
5	0.417	256.331	6.680	0.774
6	0.500	307.598	4.653	0.539
7	0.583	358.864	3.341	0.387
8	0.667	410.130	2.524	0.293
9	0.750	461.397	1.836	0.213
10	0.833	512.663	1.556	0.180
11	0.917	563.929	1.237	0.143
12	1.000	615.195	0.968	0.112
13	1.083	666.462	0.758	0.088
14	1.167	717.728	0.560	0.065
15	1.250	768.994	0.513	0.059
16	1.333	820.260	0.566	0.066
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective
(Hr.)	Percent	(In/Hr)	Max | Low	(In/Hr)	
1	0.08	0.50	0.060	(0.470) 0.046	0.014
2	0.17	0.60	0.072	(0.470) 0.056	0.016
3	0.25	0.60	0.072	(0.470) 0.056	0.016
4	0.33	0.60	0.072	(0.470) 0.056	0.016
5	0.42	0.60	0.072	(0.470) 0.056	0.016
6	0.50	0.70	0.084	(0.470) 0.065	0.019
7	0.58	0.70	0.084	(0.470) 0.065	0.019
8	0.67	0.70	0.084	(0.470) 0.065	0.019
9	0.75	0.70	0.084	(0.470) 0.065	0.019
10	0.83	0.70	0.084	(0.470) 0.065	0.019
11	0.92	0.70	0.084	(0.470) 0.065	0.019
12	1.00	0.80	0.096	(0.470) 0.074	0.022
13	1.08	0.80	0.096	(0.470) 0.074	0.022
14	1.17	0.80	0.096	(0.470) 0.074	0.022
15	1.25	0.80	0.096	(0.470) 0.074	0.022
16	1.33	0.80	0.096	(0.470) 0.074	0.022
17	1.42	0.80	0.096	(0.470) 0.074	0.022
18	1.50	0.80	0.096	(0.470) 0.074	0.022
19	1.58	0.80	0.096	(0.470) 0.074	0.022
20	1.67	0.80	0.096	(0.470) 0.074	0.022
21	1.75	0.80	0.096	(0.470) 0.074	0.022
22	1.83	0.80	0.096	(0.470) 0.074	0.022
23	1.92	0.80	0.096	(0.470) 0.074	0.022
24	2.00	0.90	0.108	(0.470) 0.083	0.025
25	2.08	0.80	0.096	(0.470) 0.074	0.022
26	2.17	0.90	0.108	(0.470) 0.083	0.025

27 2.25 0.90 0.108 (0.470) 0.083 0.025
 28 2.33 0.90 0.108 (0.470) 0.083 0.025
 29 2.42 0.90 0.108 (0.470) 0.083 0.025
 30 2.50 0.90 0.108 (0.470) 0.083 0.025
 31 2.58 0.90 0.108 (0.470) 0.083 0.025
 32 2.67 0.90 0.108 (0.470) 0.083 0.025
 33 2.75 1.00 0.120 (0.470) 0.093 0.027
 34 2.83 1.00 0.120 (0.470) 0.093 0.027
 35 2.92 1.00 0.120 (0.470) 0.093 0.027
 36 3.00 1.00 0.120 (0.470) 0.093 0.027
 37 3.08 1.00 0.120 (0.470) 0.093 0.027
 38 3.17 1.10 0.132 (0.470) 0.102 0.030
 39 3.25 1.10 0.132 (0.470) 0.102 0.030
 40 3.33 1.10 0.132 (0.470) 0.102 0.030
 41 3.42 1.20 0.144 (0.470) 0.111 0.033
 42 3.50 1.30 0.156 (0.470) 0.120 0.036
 43 3.58 1.40 0.168 (0.470) 0.130 0.038
 44 3.67 1.40 0.168 (0.470) 0.130 0.038
 45 3.75 1.50 0.180 (0.470) 0.139 0.041
 46 3.83 1.50 0.180 (0.470) 0.139 0.041
 47 3.92 1.60 0.192 (0.470) 0.148 0.044
 48 4.00 1.60 0.192 (0.470) 0.148 0.044
 49 4.08 1.70 0.204 (0.470) 0.157 0.047
 50 4.17 1.80 0.216 (0.470) 0.167 0.049
 51 4.25 1.90 0.228 (0.470) 0.176 0.052
 52 4.33 2.00 0.240 (0.470) 0.185 0.055
 53 4.42 2.10 0.252 (0.470) 0.194 0.058
 54 4.50 2.10 0.252 (0.470) 0.194 0.058
 55 4.58 2.20 0.264 (0.470) 0.204 0.060
 56 4.67 2.30 0.276 (0.470) 0.213 0.063
 57 4.75 2.40 0.288 (0.470) 0.222 0.066
 58 4.83 2.40 0.288 (0.470) 0.222 0.066
 59 4.92 2.50 0.300 (0.470) 0.231 0.069
 60 5.00 2.60 0.312 (0.470) 0.241 0.071
 61 5.08 3.10 0.372 (0.470) 0.287 0.085
 62 5.17 3.60 0.432 (0.470) 0.333 0.099
 63 5.25 3.90 0.468 (0.470) 0.361 0.107
 64 5.33 4.20 0.504 (0.470) 0.389 0.115
 65 5.42 4.70 0.564 (0.470) 0.435 0.129
 66 5.50 5.60 0.672 0.470 (0.518) 0.202
 67 5.58 1.90 0.228 (0.470) 0.176 0.052
 68 5.67 0.90 0.108 (0.470) 0.083 0.025
 69 5.75 0.60 0.072 (0.470) 0.056 0.016
 70 5.83 0.50 0.060 (0.470) 0.046 0.014
 71 5.92 0.30 0.036 (0.470) 0.028 0.008
 72 6.00 0.20 0.024 (0.470) 0.019 0.005
 (Loss Rate Not Used)
 Sum = 100.0 Sum = 2.8
 Flood volume = Effective rainfall 0.23(In)
 times area 11.5(Ac.)/(In)/(Ft.) = 0.2(Ac.Ft)
 Total soil loss = 0.77(In)
 Total soil loss = 0.735(Ac.Ft)
 Total rainfall = 1.00(In)
 Flood volume = 9718.9 Cubic Feet
 Total soil loss = 32024.5 Cubic Feet

 Peak flow rate of this hydrograph = 1.522(CFS)

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 6 - H O U R S T O R M
 Run off f Hydrograph

 Hydrograph in 5 Minute intervals ((CFS))

 Time(h:m) Volume Ac.Ft Q(CFS) 0 2.5 5.0 7.5 10.0

 0+ 5 0.0001 0.01 Q | | | |
 0+10 0.0005 0.06 Q | | | |
 0+15 0.0012 0.11 Q | | | |
 0+20 0.0022 0.14 Q | | | |

0+25 0.0032 0.15 Q | | | |
 0+30 0.0044 0.17 Q | | | |
 0+35 0.0056 0.18 QV | | | |
 0+40 0.0069 0.19 QV | | | |
 0+45 0.0083 0.20 QV | | | |
 0+50 0.0098 0.21 QV | | | |
 0+55 0.0112 0.21 QV | | | |
 1+ 0 0.0127 0.22 QV | | | |
 1+ 5 0.0143 0.23 QV | | | |
 1+10 0.0159 0.24 QV | | | |
 1+15 0.0176 0.24 QV | | | |
 1+20 0.0193 0.25 QV | | | |
 1+25 0.0210 0.25 QV | | | |
 1+30 0.0228 0.25 QV | | | |
 1+35 0.0245 0.25 QV | | | |
 1+40 0.0262 0.25 QV | | | |
 1+45 0.0280 0.25 QV | | | |
 1+50 0.0297 0.25 QV | | | |
 1+55 0.0315 0.25 QV | | | |
 2+ 0 0.0332 0.26 QV | | | |
 2+ 5 0.0350 0.26 QV | | | |
 2+10 0.0369 0.27 QV | | | |
 2+15 0.0387 0.27 QV | | | |
 2+20 0.0406 0.28 QV | | | |
 2+25 0.0426 0.28 QV | | | |
 2+30 0.0445 0.28 QV | | | |
 2+35 0.0465 0.28 QV | | | |
 2+40 0.0484 0.28 QV | | | |
 2+45 0.0504 0.29 QV | | | |
 2+50 0.0524 0.30 QV | | | |
 2+55 0.0545 0.31 QV | | | |
 3+ 0 0.0567 0.31 QV | | | |
 3+ 5 0.0588 0.31 QV | | | |
 3+10 0.0610 0.32 QV | | | |
 3+15 0.0632 0.33 QV | | | |
 3+20 0.0655 0.34 QV | | | |
 3+25 0.0679 0.34 QV | | | |
 3+30 0.0703 0.36 QV | | | |
 3+35 0.0729 0.38 QV | | | |
 3+40 0.0757 0.40 QV | | | |
 3+45 0.0786 0.42 QV | | | |
 3+50 0.0816 0.44 QV | | | |
 3+55 0.0847 0.45 QV | | | |
 4+ 0 0.0879 0.47 QV | | | |
 4+ 5 0.0913 0.48 QV | | | |
 4+10 0.0947 0.50 QV | | | |
 4+15 0.0984 0.53 QV | | | |
 4+20 0.1022 0.56 QV | | | |
 4+25 0.1062 0.58 QV | | | |
 4+30 0.1104 0.61 QV | | | |
 4+35 0.1148 0.63 QV | | | |
 4+40 0.1193 0.65 QV | | | |
 4+45 0.1240 0.68 QV | | | |
 4+50 0.1288 0.71 QV | | | |
 4+55 0.1339 0.73 QV | | | |
 5+ 0 0.1390 0.75 QV | | | |
 5+ 5 0.1444 0.79 QV | | | |
 5+10 0.1503 0.86 QV | | | |
 5+15 0.1570 0.96 QV | | | |
 5+20 0.1643 1.07 QV | | | |
 5+25 0.1723 1.16 QV | | | |
 5+30 0.1814 1.32 QV | | | |
 5+35 0.1919 1.52 QV | | | |
 5+40 0.2010 1.31 QV | | | |
 5+45 0.2069 0.86 QV | | | |
 5+50 0.2110 0.59 QV | | | |
 5+55 0.2141 0.45 QV | | | |
 6+ 0 0.2165 0.35 QV | | | |
 6+ 5 0.2183 0.27 QV | | | |
 6+10 0.2196 0.19 QV | | | |
 6+15 0.2206 0.14 QV | | | |

6+20	0.2213	0.11	Q	|	|	|	V|
6+25	0.2219	0.08	Q	|	|	|	V|
6+30	0.2223	0.06	Q	|	|	|	V|
6+35	0.2226	0.04	Q	|	|	|	V|
6+40	0.2228	0.03	Q	|	|	|	V|
6+45	0.2230	0.02	Q	|	|	|	V|
6+50	0.2230	0.01	Q	|	|	|	V|
6+55	0.2231	0.00	Q	|	|	|	V|
7+ 0	0.2231	0.00	Q	|	|	|	V|
7+ 5	0.2231	0.00	Q	|	|	|	V|
7+10	0.2231	0.00	Q	|	|	|	V|
7+15	0.2231	0.00	Q	|	|	|	V|

24-HOUR STORM DURATION

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
Study date 01/31/18 File: ARAPRE242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
EXISTING CONDITION
FN: ARAPRE

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Area Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.

Difference in elevation = 34.70(Ft.)

Slope along watercourse = 54.8880 Ft./Mi.

Average Manning's 'N' = 0.030

Lag time = 0.163 Hr.

Lag time = 9.75 Min.

25% of lag time = 2.44 Min.

40% of lag time = 3.90 Min.

Unit time = 5.00 Min.

Duration of storm = 24 Hour(s)

User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 1.60 18.40

100 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 4.10 47.15

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.100(In)

Point rain (area averaged) = 1.600(In)
Areal adjustment factor = 100.00 %

Adjusted average point rain = 1.600(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 71.00 0.161
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
71.0	52.2	0.550	0.161	0.470	1.000	0.470
					Sum (F)	0.470

Area averaged mean soil loss (F) (In/Hr) = 0.470

Minimum soil loss rate ((In/Hr)) = 0.235

(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.771

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1 0.083	51.266	6.366	0.738
2 0.167	102.533	27.222	3.155
3 0.250	153.799	28.703	3.327
4 0.333	205.065	12.516	1.451
5 0.417	256.331	6.680	0.774
6 0.500	307.598	4.653	0.539
7 0.583	358.864	3.341	0.387
8 0.667	410.130	2.524	0.293
9 0.750	461.397	1.836	0.213
10 0.833	512.663	1.556	0.180
11 0.917	563.929	1.237	0.143
12 1.000	615.195	0.968	0.112
13 1.083	666.462	0.758	0.088
14 1.167	717.728	0.560	0.065
15 1.250	768.994	0.513	0.059
16 1.333	820.260	0.566	0.066
		Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective
(Hr.)	Percent	(In/Hr)	Max | Low	(In/Hr)	
1 0.08	0.07	0.013	(0.833) | ( 0.830)	0.010 | 0.010	0.003
2 0.17	0.07	0.013	(0.830) | ( 0.830)	0.010 | 0.010	0.003
3 0.25	0.07	0.013	(0.827) | ( 0.827)	0.010 | 0.010	0.003
4 0.33	0.10	0.019	(0.823) | ( 0.823)	0.015 | 0.015	0.004
5 0.42	0.10	0.019	(0.820) | ( 0.820)	0.015 | 0.015	0.004
6 0.50	0.10	0.019	(0.817) | ( 0.817)	0.015 | 0.015	0.004
7 0.58	0.10	0.019	(0.814) | ( 0.814)	0.015 | 0.015	0.004
8 0.67	0.10	0.019	(0.811) | ( 0.811)	0.015 | 0.015	0.004
9 0.75	0.10	0.019	(0.807) | ( 0.807)	0.015 | 0.015	0.004
10 0.83	0.13	0.026	(0.804) | ( 0.804)	0.020 | 0.020	0.006
11 0.92	0.13	0.026	(0.801) | ( 0.801)	0.020 | 0.020	0.006
12 1.00	0.13	0.026	(0.798) | ( 0.798)	0.020 | 0.020	0.006
13 1.08	0.10	0.019	(0.795) | ( 0.795)	0.015 | 0.015	0.004
14 1.17	0.10	0.019	(0.792) | ( 0.792)	0.015 | 0.015	0.004
15 1.25	0.10	0.019	(0.789) | ( 0.789)	0.015 | 0.015	0.004
16 1.33	0.10	0.019	(0.785) | ( 0.785)	0.015 | 0.015	0.004
17 1.42	0.10	0.019	(0.782) | ( 0.782)	0.015 | 0.015	0.004
18 1.50	0.10	0.019	(0.779) | ( 0.779)	0.015 | 0.015	0.004
19 1.58	0.10	0.019	(0.776) | ( 0.776)	0.015 | 0.015	0.004
20 1.67	0.10	0.019	(0.773) | ( 0.773)	0.015 | 0.015	0.004
21 1.75	0.10	0.019	(0.770) | ( 0.770)	0.015 | 0.015	0.004
22 1.83	0.13	0.026	(0.767) | ( 0.767)	0.020 | 0.020	0.006
23 1.92	0.13	0.026	(0.764) | ( 0.764)	0.020 | 0.020	0.006
24 2.00	0.13	0.026	(0.761) | ( 0.761)	0.020 | 0.020	0.006
25 2.08	0.13	0.026	(0.757) | ( 0.757)	0.020 | 0.020	0.006
26 2.17	0.13	0.026	(0.754) | ( 0.754)	0.020 | 0.020	0.006

27	2.25	0.13	0.026	(0.751)	0.020	0.006		98	8.17	0.50	0.096	(0.551)	0.074	0.022
28	2.33	0.13	0.026	(0.748)	0.020	0.006		99	8.25	0.50	0.096	(0.548)	0.074	0.022
29	2.42	0.13	0.026	(0.745)	0.020	0.006		100	8.33	0.50	0.096	(0.546)	0.074	0.022
30	2.50	0.13	0.026	(0.742)	0.020	0.006		101	8.42	0.50	0.096	(0.543)	0.074	0.022
31	2.58	0.17	0.032	(0.739)	0.025	0.007		102	8.50	0.50	0.096	(0.541)	0.074	0.022
32	2.67	0.17	0.032	(0.736)	0.025	0.007		103	8.58	0.53	0.102	(0.538)	0.079	0.023
33	2.75	0.17	0.032	(0.733)	0.025	0.007		104	8.67	0.53	0.102	(0.536)	0.079	0.023
34	2.83	0.17	0.032	(0.730)	0.025	0.007		105	8.75	0.53	0.102	(0.533)	0.079	0.023
35	2.92	0.17	0.032	(0.727)	0.025	0.007		106	8.83	0.57	0.109	(0.531)	0.084	0.025
36	3.00	0.17	0.032	(0.724)	0.025	0.007		107	8.92	0.57	0.109	(0.528)	0.084	0.025
37	3.08	0.17	0.032	(0.721)	0.025	0.007		108	9.00	0.57	0.109	(0.526)	0.084	0.025
38	3.17	0.17	0.032	(0.718)	0.025	0.007		109	9.08	0.63	0.122	(0.523)	0.094	0.028
39	3.25	0.17	0.032	(0.715)	0.025	0.007		110	9.17	0.63	0.122	(0.521)	0.094	0.028
40	3.33	0.17	0.032	(0.712)	0.025	0.007		111	9.25	0.63	0.122	(0.518)	0.094	0.028
41	3.42	0.17	0.032	(0.709)	0.025	0.007		112	9.33	0.67	0.128	(0.516)	0.099	0.029
42	3.50	0.17	0.032	(0.706)	0.025	0.007		113	9.42	0.67	0.128	(0.513)	0.099	0.029
43	3.58	0.17	0.032	(0.703)	0.025	0.007		114	9.50	0.67	0.128	(0.511)	0.099	0.029
44	3.67	0.17	0.032	(0.700)	0.025	0.007		115	9.58	0.70	0.134	(0.508)	0.104	0.031
45	3.75	0.17	0.032	(0.697)	0.025	0.007		116	9.67	0.70	0.134	(0.506)	0.104	0.031
46	3.83	0.20	0.038	(0.694)	0.030	0.009		117	9.75	0.70	0.134	(0.503)	0.104	0.031
47	3.92	0.20	0.038	(0.691)	0.030	0.009		118	9.83	0.73	0.141	(0.501)	0.109	0.032
48	4.00	0.20	0.038	(0.688)	0.030	0.009		119	9.92	0.73	0.141	(0.499)	0.109	0.032
49	4.08	0.20	0.038	(0.686)	0.030	0.009		120	10.00	0.73	0.141	(0.496)	0.109	0.032
50	4.17	0.20	0.038	(0.683)	0.030	0.009		121	10.08	0.50	0.096	(0.494)	0.074	0.022
51	4.25	0.20	0.038	(0.680)	0.030	0.009		122	10.17	0.50	0.096	(0.491)	0.074	0.022
52	4.33	0.23	0.045	(0.677)	0.035	0.010		123	10.25	0.50	0.096	(0.489)	0.074	0.022
53	4.42	0.23	0.045	(0.674)	0.035	0.010		124	10.33	0.50	0.096	(0.487)	0.074	0.022
54	4.50	0.23	0.045	(0.671)	0.035	0.010		125	10.42	0.50	0.096	(0.484)	0.074	0.022
55	4.58	0.23	0.045	(0.668)	0.035	0.010		126	10.50	0.50	0.096	(0.482)	0.074	0.022
56	4.67	0.23	0.045	(0.665)	0.035	0.010		127	10.58	0.67	0.128	(0.480)	0.099	0.029
57	4.75	0.23	0.045	(0.662)	0.035	0.010		128	10.67	0.67	0.128	(0.477)	0.099	0.029
58	4.83	0.27	0.051	(0.660)	0.039	0.012		129	10.75	0.67	0.128	(0.475)	0.099	0.029
59	4.92	0.27	0.051	(0.657)	0.039	0.012		130	10.83	0.67	0.128	(0.473)	0.099	0.029
60	5.00	0.27	0.051	(0.654)	0.039	0.012		131	10.92	0.67	0.128	(0.470)	0.099	0.029
61	5.08	0.20	0.038	(0.651)	0.030	0.009		132	11.00	0.67	0.128	(0.468)	0.099	0.029
62	5.17	0.20	0.038	(0.648)	0.030	0.009		133	11.08	0.63	0.122	(0.466)	0.094	0.028
63	5.25	0.20	0.038	(0.645)	0.030	0.009		134	11.17	0.63	0.122	(0.463)	0.094	0.028
64	5.33	0.23	0.045	(0.643)	0.035	0.010		135	11.25	0.63	0.122	(0.461)	0.094	0.028
65	5.42	0.23	0.045	(0.640)	0.035	0.010		136	11.33	0.63	0.122	(0.459)	0.094	0.028
66	5.50	0.23	0.045	(0.637)	0.035	0.010		137	11.42	0.63	0.122	(0.457)	0.094	0.028
67	5.58	0.27	0.051	(0.634)	0.039	0.012		138	11.50	0.63	0.122	(0.454)	0.094	0.028
68	5.67	0.27	0.051	(0.631)	0.039	0.012		139	11.58	0.57	0.109	(0.452)	0.084	0.025
69	5.75	0.27	0.051	(0.629)	0.039	0.012		140	11.67	0.57	0.109	(0.450)	0.084	0.025
70	5.83	0.27	0.051	(0.626)	0.039	0.012		141	11.75	0.57	0.109	(0.448)	0.084	0.025
71	5.92	0.27	0.051	(0.623)	0.039	0.012		142	11.83	0.60	0.115	(0.445)	0.089	0.026
72	6.00	0.27	0.051	(0.620)	0.039	0.012		143	11.92	0.60	0.115	(0.443)	0.089	0.026
73	6.08	0.30	0.058	(0.618)	0.044	0.013		144	12.00	0.60	0.115	(0.441)	0.089	0.026
74	6.17	0.30	0.058	(0.615)	0.044	0.013		145	12.08	0.83	0.160	(0.439)	0.123	0.037
75	6.25	0.30	0.058	(0.612)	0.044	0.013		146	12.17	0.83	0.160	(0.436)	0.123	0.037
76	6.33	0.30	0.058	(0.609)	0.044	0.013		147	12.25	0.83	0.160	(0.434)	0.123	0.037
77	6.42	0.30	0.058	(0.607)	0.044	0.013		148	12.33	0.87	0.166	(0.432)	0.128	0.038
78	6.50	0.30	0.058	(0.604)	0.044	0.013		149	12.42	0.87	0.166	(0.430)	0.128	0.038
79	6.58	0.33	0.064	(0.601)	0.049	0.015		150	12.50	0.87	0.166	(0.428)	0.128	0.038
80	6.67	0.33	0.064	(0.598)	0.049	0.015		151	12.58	0.93	0.179	(0.426)	0.138	0.041
81	6.75	0.33	0.064	(0.596)	0.049	0.015		152	12.67	0.93	0.179	(0.423)	0.138	0.041
82	6.83	0.33	0.064	(0.593)	0.049	0.015		153	12.75	0.93	0.179	(0.421)	0.138	0.041
83	6.92	0.33	0.064	(0.590)	0.049	0.015		154	12.83	0.97	0.186	(0.419)	0.143	0.042
84	7.00	0.33	0.064	(0.588)	0.049	0.015		155	12.92	0.97	0.186	(0.417)	0.143	0.042
85	7.08	0.33	0.064	(0.585)	0.049	0.015		156	13.00	0.97	0.186	(0.415)	0.143	0.042
86	7.17	0.33	0.064	(0.582)	0.049	0.015		157	13.08	1.13	0.218	(0.413)	0.168	0.050
87	7.25	0.33	0.064	(0.580)	0.049	0.015		158	13.17	1.13	0.218	(0.411)	0.168	0.050
88	7.33	0.37	0.070	(0.577)	0.054	0.016		159	13.25	1.13	0.218	(0.409)	0.168	0.050
89	7.42	0.37	0.070	(0.574)	0.054	0.016		160	13.33	1.13	0.218	(0.407)	0.168	0.050
90	7.50	0.37	0.070	(0.572)	0.054	0.016		161	13.42	1.13	0.218	(0.405)	0.168	0.050
91	7.58	0.40	0.077	(0.569)	0.059	0.018		162	13.50	1.13	0.218	(0.403)	0.168	0.050
92	7.67	0.40	0.077	(0.567)	0.059	0.018		163	13.58	0.77	0.147	(0.400)	0.114	0.034
93	7.75	0.40	0.077	(0.564)	0.059	0.018		164	13.67	0.77	0.147	(0.398)	0.114	0.034
94	7.83	0.43	0.083	(0.561)	0.064	0.019		165	13.75	0.77	0.147	(0.396)	0.114	0.034
95	7.92	0.43	0.083	(0.559)	0.064	0.019		166	13.83	0.77	0.147	(0.394)	0.114	0.034
96	8.00	0.43	0.083	(0.556)	0.064	0.019		167	13.92	0.77	0.147	(0.392)	0.114	0.034
97	8.08	0.50	0.096	(0.554)	0.074	0.022		168	14.00	0.77	0.147	(0.390)	0.114	0.034

169	14.08	0.90	0.173	(0.388)	0.133	0.040			240	20.00	0.07	0.013	(0.273)	0.010	0.003
170	14.17	0.90	0.173	(0.386)	0.133	0.040			241	20.08	0.10	0.019	(0.272)	0.015	0.004
171	14.25	0.90	0.173	(0.384)	0.133	0.040			242	20.17	0.10	0.019	(0.270)	0.015	0.004
172	14.33	0.87	0.166	(0.382)	0.128	0.038			243	20.25	0.10	0.019	(0.269)	0.015	0.004
173	14.42	0.87	0.166	(0.380)	0.128	0.038			244	20.33	0.10	0.019	(0.268)	0.015	0.004
174	14.50	0.87	0.166	(0.379)	0.128	0.038			245	20.42	0.10	0.019	(0.267)	0.015	0.004
175	14.58	0.87	0.166	(0.377)	0.128	0.038			246	20.50	0.10	0.019	(0.266)	0.015	0.004
176	14.67	0.87	0.166	(0.375)	0.128	0.038			247	20.58	0.10	0.019	(0.265)	0.015	0.004
177	14.75	0.87	0.166	(0.373)	0.128	0.038			248	20.67	0.10	0.019	(0.264)	0.015	0.004
178	14.83	0.83	0.160	(0.371)	0.123	0.037			249	20.75	0.10	0.019	(0.263)	0.015	0.004
179	14.92	0.83	0.160	(0.369)	0.123	0.037			250	20.83	0.07	0.013	(0.261)	0.010	0.003
180	15.00	0.83	0.160	(0.367)	0.123	0.037			251	20.92	0.07	0.013	(0.260)	0.010	0.003
181	15.08	0.80	0.154	(0.365)	0.118	0.035			252	21.00	0.07	0.013	(0.259)	0.010	0.003
182	15.17	0.80	0.154	(0.363)	0.118	0.035			253	21.08	0.10	0.019	(0.258)	0.015	0.004
183	15.25	0.80	0.154	(0.361)	0.118	0.035			254	21.17	0.10	0.019	(0.257)	0.015	0.004
184	15.33	0.77	0.147	(0.360)	0.114	0.034			255	21.25	0.10	0.019	(0.256)	0.015	0.004
185	15.42	0.77	0.147	(0.358)	0.114	0.034			256	21.33	0.07	0.013	(0.255)	0.010	0.003
186	15.50	0.77	0.147	(0.356)	0.114	0.034			257	21.42	0.07	0.013	(0.254)	0.010	0.003
187	15.58	0.63	0.122	(0.354)	0.094	0.028			258	21.50	0.07	0.013	(0.253)	0.010	0.003
188	15.67	0.63	0.122	(0.352)	0.094	0.028			259	21.58	0.10	0.019	(0.253)	0.015	0.004
189	15.75	0.63	0.122	(0.350)	0.094	0.028			260	21.67	0.10	0.019	(0.252)	0.015	0.004
190	15.83	0.63	0.122	(0.349)	0.094	0.028			261	21.75	0.10	0.019	(0.251)	0.015	0.004
191	15.92	0.63	0.122	(0.347)	0.094	0.028			262	21.83	0.07	0.013	(0.250)	0.010	0.003
192	16.00	0.63	0.122	(0.345)	0.094	0.028			263	21.92	0.07	0.013	(0.249)	0.010	0.003
193	16.08	0.13	0.026	(0.343)	0.020	0.006			264	22.00	0.07	0.013	(0.248)	0.010	0.003
194	16.17	0.13	0.026	(0.342)	0.020	0.006			265	22.08	0.10	0.019	(0.247)	0.015	0.004
195	16.25	0.13	0.026	(0.340)	0.020	0.006			266	22.17	0.10	0.019	(0.246)	0.015	0.004
196	16.33	0.13	0.026	(0.338)	0.020	0.006			267	22.25	0.10	0.019	(0.246)	0.015	0.004
197	16.42	0.13	0.026	(0.336)	0.020	0.006			268	22.33	0.07	0.013	(0.245)	0.010	0.003
198	16.50	0.13	0.026	(0.335)	0.020	0.006			269	22.42	0.07	0.013	(0.244)	0.010	0.003
199	16.58	0.10	0.019	(0.333)	0.015	0.004			270	22.50	0.07	0.013	(0.243)	0.010	0.003
200	16.67	0.10	0.019	(0.331)	0.015	0.004			271	22.58	0.07	0.013	(0.243)	0.010	0.003
201	16.75	0.10	0.019	(0.330)	0.015	0.004			272	22.67	0.07	0.013	(0.242)	0.010	0.003
202	16.83	0.10	0.019	(0.328)	0.015	0.004			273	22.75	0.07	0.013	(0.241)	0.010	0.003
203	16.92	0.10	0.019	(0.326)	0.015	0.004			274	22.83	0.07	0.013	(0.241)	0.010	0.003
204	17.00	0.10	0.019	(0.325)	0.015	0.004			275	22.92	0.07	0.013	(0.240)	0.010	0.003
205	17.08	0.17	0.032	(0.323)	0.025	0.007			276	23.00	0.07	0.013	(0.240)	0.010	0.003
206	17.17	0.17	0.032	(0.321)	0.025	0.007			277	23.08	0.07	0.013	(0.239)	0.010	0.003
207	17.25	0.17	0.032	(0.320)	0.025	0.007			278	23.17	0.07	0.013	(0.239)	0.010	0.003
208	17.33	0.17	0.032	(0.318)	0.025	0.007			279	23.25	0.07	0.013	(0.238)	0.010	0.003
209	17.42	0.17	0.032	(0.317)	0.025	0.007			280	23.33	0.07	0.013	(0.238)	0.010	0.003
210	17.50	0.17	0.032	(0.315)	0.025	0.007			281	23.42	0.07	0.013	(0.237)	0.010	0.003
211	17.58	0.17	0.032	(0.313)	0.025	0.007			282	23.50	0.07	0.013	(0.237)	0.010	0.003
212	17.67	0.17	0.032	(0.312)	0.025	0.007			283	23.58	0.07	0.013	(0.236)	0.010	0.003
213	17.75	0.17	0.032	(0.310)	0.025	0.007			284	23.67	0.07	0.013	(0.236)	0.010	0.003
214	17.83	0.13	0.026	(0.309)	0.020	0.006			285	23.75	0.07	0.013	(0.236)	0.010	0.003
215	17.92	0.13	0.026	(0.307)	0.020	0.006			286	23.83	0.07	0.013	(0.235)	0.010	0.003
216	18.00	0.13	0.026	(0.306)	0.020	0.006			287	23.92	0.07	0.013	(0.235)	0.010	0.003
217	18.08	0.13	0.026	(0.304)	0.020	0.006			288	24.00	0.07	0.013	(0.235)	0.010	0.003
218	18.17	0.13	0.026	(0.303)	0.020	0.006									
219	18.25	0.13	0.026	(0.301)	0.020	0.006									
220	18.33	0.13	0.026	(0.300)	0.020	0.006									
221	18.42	0.13	0.026	(0.298)	0.020	0.006									
222	18.50	0.13	0.026	(0.297)	0.020	0.006									
223	18.58	0.10	0.019	(0.295)	0.015	0.004									
224	18.67	0.10	0.019	(0.294)	0.015	0.004									
225	18.75	0.10	0.019	(0.293)	0.015	0.004									
226	18.83	0.07	0.013	(0.291)	0.010	0.003									
227	18.92	0.07	0.013	(0.290)	0.010	0.003									
228	19.00	0.07	0.013	(0.288)	0.010	0.003									
229	19.08	0.10	0.019	(0.287)	0.015	0.004									
230	19.17	0.10	0.019	(0.286)	0.015	0.004									
231	19.25	0.10	0.019	(0.284)	0.015	0.004									
232	19.33	0.13	0.026	(0.283)	0.020	0.006									
233	19.42	0.13	0.026	(0.282)	0.020	0.006									
234	19.50	0.13	0.026	(0.280)	0.020	0.006									
235	19.58	0.10	0.019	(0.279)	0.015	0.004									
236	19.67	0.10	0.019	(0.278)	0.015	0.004									
237	19.75	0.10	0.019	(0.277)	0.015	0.004									
238	19.83	0.07	0.013	(0.275)	0.010	0.003									
239	19.92	0.07	0.013	(0.274)	0.010	0.003									

(Loss Rate Not Used)

Sum = 100.0 Sum = 4.4

Flood volume = Effective rainfall 0.37(In)
times area 11.5(Ac.)/(l(In)/(Ft.)) = 0.4(Ac.Ft)

Total soil loss = 1.23(In)
Total soil loss = 1.182(Ac.Ft)
Total rainfall = 1.60(In)
Flood volume = 15281.7 Cubic Feet
Total soil loss = 51508.8 Cubic Feet

Peak flow rate of this hydrograph = 0.564(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m) Volume Ac.Ft Q(CFS) 0 2.5 5.0 7.5 10.0

0+ 5 0.0000 0.00 Q | | | | |

0+10	0.0001	0.01	Q
0+15	0.0002	0.02	Q
0+20	0.0004	0.03	Q
0+25	0.0007	0.03	Q
0+30	0.0009	0.04	Q
0+35	0.0012	0.04	Q
0+40	0.0015	0.05	Q
0+45	0.0019	0.05	Q
0+50	0.0022	0.05	Q
0+55	0.0026	0.05	Q
1+ 0	0.0030	0.06	Q
1+ 5	0.0034	0.06	Q
1+10	0.0038	0.06	Q
1+15	0.0042	0.05	Q
1+20	0.0045	0.05	Q
1+25	0.0049	0.05	Q
1+30	0.0053	0.05	Q
1+35	0.0056	0.05	Q
1+40	0.0060	0.05	Q
1+45	0.0063	0.05	Q
1+50	0.0067	0.05	Q
1+55	0.0071	0.06	Q
2+ 0	0.0075	0.06	Q
2+ 5	0.0079	0.06	Q
2+10	0.0084	0.06	Q
2+15	0.0088	0.07	QV
2+20	0.0093	0.07	QV
2+25	0.0098	0.07	QV
2+30	0.0102	0.07	QV
2+35	0.0107	0.07	QV
2+40	0.0112	0.07	QV
2+45	0.0117	0.08	QV
2+50	0.0123	0.08	QV
2+55	0.0128	0.08	QV
3+ 0	0.0134	0.08	QV
3+ 5	0.0140	0.08	QV
3+10	0.0146	0.08	QV
3+15	0.0151	0.08	QV
3+20	0.0157	0.08	QV
3+25	0.0163	0.08	QV
3+30	0.0169	0.08	QV
3+35	0.0175	0.08	QV
3+40	0.0180	0.08	Q V
3+45	0.0186	0.08	Q V
3+50	0.0192	0.09	Q V
3+55	0.0198	0.09	Q V
4+ 0	0.0205	0.10	Q V
4+ 5	0.0212	0.10	Q V
4+10	0.0219	0.10	Q V
4+15	0.0225	0.10	Q V
4+20	0.0232	0.10	Q V
4+25	0.0240	0.11	Q V
4+30	0.0247	0.11	Q V
4+35	0.0255	0.11	Q V
4+40	0.0263	0.12	Q V
4+45	0.0271	0.12	Q V
4+50	0.0279	0.12	Q V
4+55	0.0288	0.12	Q V
5+ 0	0.0297	0.13	Q V
5+ 5	0.0305	0.13	Q V
5+10	0.0314	0.12	Q V
5+15	0.0321	0.11	Q V
5+20	0.0329	0.11	Q V
5+25	0.0337	0.11	Q V
5+30	0.0345	0.12	Q V
5+35	0.0353	0.12	Q V
5+40	0.0361	0.12	Q V
5+45	0.0370	0.13	Q V
5+50	0.0379	0.13	Q V
5+55	0.0388	0.13	Q V
6+ 0	0.0398	0.13	Q V

6+ 5	0.0407	0.13	Q V
6+10	0.0416	0.14	Q V
6+15	0.0426	0.15	Q V
6+20	0.0437	0.15	Q V
6+25	0.0447	0.15	Q V
6+30	0.0457	0.15	Q V
6+35	0.0468	0.15	Q V
6+40	0.0478	0.16	Q V
6+45	0.0490	0.16	Q V
6+50	0.0501	0.16	Q V
6+55	0.0512	0.17	Q V
7+ 0	0.0524	0.17	Q V
7+ 5	0.0536	0.17	Q V
7+10	0.0547	0.17	Q V
7+15	0.0559	0.17	Q V
7+20	0.0570	0.17	Q V
7+25	0.0582	0.17	Q V
7+30	0.0595	0.18	Q V
7+35	0.0607	0.18	Q V
7+40	0.0621	0.19	Q V
7+45	0.0634	0.19	Q V
7+50	0.0648	0.20	Q V
7+55	0.0662	0.20	Q V
8+ 0	0.0676	0.21	Q V
8+ 5	0.0691	0.22	Q V
8+10	0.0707	0.23	Q V
8+15	0.0723	0.24	Q V
8+20	0.0740	0.24	Q V
8+25	0.0757	0.25	Q V
8+30	0.0774	0.25	Q V
8+35	0.0791	0.25	Q V
8+40	0.0809	0.26	Q V
8+45	0.0827	0.26	Q V
8+50	0.0845	0.27	Q V
8+55	0.0864	0.27	Q V
9+ 0	0.0883	0.28	Q V
9+ 5	0.0903	0.28	Q V
9+10	0.0923	0.30	Q V
9+15	0.0944	0.31	Q V
9+20	0.0966	0.31	Q V
9+25	0.0988	0.32	Q V
9+30	0.1011	0.33	Q V
9+35	0.1033	0.33	Q V
9+40	0.1057	0.34	Q V
9+45	0.1081	0.35	Q V
9+50	0.1105	0.35	Q V
9+55	0.1129	0.36	Q V
10+ 0	0.1154	0.36	Q V
10+ 5	0.1179	0.36	Q V
10+10	0.1201	0.33	Q V
10+15	0.1222	0.30	Q V
10+20	0.1241	0.28	Q V
10+25	0.1260	0.27	Q V
10+30	0.1279	0.27	Q V
10+35	0.1297	0.27	Q V
10+40	0.1317	0.29	Q V
10+45	0.1339	0.31	Q V
10+50	0.1361	0.32	Q V
10+55	0.1384	0.33	Q V
11+ 0	0.1407	0.33	Q V
11+ 5	0.1430	0.33	Q V
11+10	0.1452	0.33	Q V
11+15	0.1475	0.32	Q V
11+20	0.1497	0.32	Q V
11+25	0.1519	0.32	Q V
11+30	0.1541	0.32	Q V
11+35	0.1563	0.32	Q V
11+40	0.1585	0.31	Q V
11+45	0.1606	0.30	Q V
11+50	0.1626	0.30	Q V
11+55	0.1647	0.30	Q V

12+ 0	0.1668	0.30	Q	V				17+55	0.3267	0.08	Q	
12+ 5	0.1689	0.31	Q	V				18+ 0	0.3272	0.07	Q	
12+10	0.1713	0.35	Q	V				18+ 5	0.3277	0.07	Q	
12+15	0.1739	0.38	Q	V				18+10	0.3282	0.07	Q	
12+20	0.1767	0.40	Q	V				18+15	0.3287	0.07	Q	
12+25	0.1795	0.41	Q	V				18+20	0.3292	0.07	Q	
12+30	0.1824	0.42	Q	V				18+25	0.3297	0.07	Q	
12+35	0.1853	0.43	Q	V				18+30	0.3301	0.07	Q	
12+40	0.1883	0.44	Q	V				18+35	0.3306	0.07	Q	
12+45	0.1914	0.45	Q	V				18+40	0.3310	0.06	Q	
12+50	0.1946	0.46	Q	V				18+45	0.3314	0.06	Q	
12+55	0.1978	0.47	Q	V				18+50	0.3318	0.05	Q	
13+ 0	0.2011	0.48	Q	V				18+55	0.3321	0.05	Q	
13+ 5	0.2045	0.49	Q	V				19+ 0	0.3324	0.04	Q	
13+10	0.2080	0.51	Q	V				19+ 5	0.3327	0.04	Q	
13+15	0.2117	0.54	Q	V				19+10	0.3330	0.04	Q	
13+20	0.2155	0.55	Q	V				19+15	0.3334	0.05	Q	
13+25	0.2194	0.56	Q	V				19+20	0.3337	0.05	Q	
13+30	0.2233	0.56	Q	V				19+25	0.3341	0.06	Q	
13+35	0.2271	0.56	Q	V				19+30	0.3345	0.06	Q	
13+40	0.2306	0.51	Q	V				19+35	0.3349	0.06	Q	
13+45	0.2337	0.46	Q	V				19+40	0.3353	0.06	Q	
13+50	0.2367	0.43	Q	V				19+45	0.3357	0.05	Q	
13+55	0.2396	0.42	Q	V				19+50	0.3361	0.05	Q	
14+ 0	0.2425	0.41	Q	V				19+55	0.3364	0.05	Q	
14+ 5	0.2453	0.41	Q	V				20+ 0	0.3367	0.04	Q	
14+10	0.2483	0.43	Q	V				20+ 5	0.3369	0.04	Q	
14+15	0.2513	0.44	Q	V				20+10	0.3372	0.04	Q	
14+20	0.2544	0.45	Q	V				20+15	0.3376	0.05	Q	
14+25	0.2575	0.45	Q	V				20+20	0.3379	0.05	Q	
14+30	0.2605	0.44	Q	V				20+25	0.3382	0.05	Q	
14+35	0.2636	0.44	Q	V				20+30	0.3386	0.05	Q	
14+40	0.2666	0.44	Q	V				20+35	0.3389	0.05	Q	
14+45	0.2696	0.44	Q	V				20+40	0.3393	0.05	Q	
14+50	0.2727	0.44	Q	V				20+45	0.3396	0.05	Q	
14+55	0.2757	0.43	Q	V				20+50	0.3400	0.05	Q	
15+ 0	0.2786	0.43	Q	V				20+55	0.3403	0.04	Q	
15+ 5	0.2816	0.43	Q	V				21+ 0	0.3406	0.04	Q	
15+10	0.2845	0.42	Q	V				21+ 5	0.3408	0.04	Q	
15+15	0.2873	0.42	Q	V				21+10	0.3411	0.04	Q	
15+20	0.2902	0.41	Q	V				21+15	0.3414	0.05	Q	
15+25	0.2930	0.41	Q	V				21+20	0.3418	0.05	Q	
15+30	0.2957	0.40	Q	V				21+25	0.3421	0.04	Q	
15+35	0.2984	0.39	Q	V				21+30	0.3423	0.04	Q	
15+40	0.3010	0.37	Q	V				21+35	0.3426	0.04	Q	
15+45	0.3034	0.35	Q	V				21+40	0.3429	0.04	Q	
15+50	0.3058	0.34	Q	V				21+45	0.3432	0.05	Q	
15+55	0.3081	0.34	Q	V				21+50	0.3435	0.05	Q	
16+ 0	0.3104	0.33	Q	V				21+55	0.3438	0.04	Q	
16+ 5	0.3126	0.31	Q	V				22+ 0	0.3441	0.04	Q	
16+10	0.3143	0.24	Q	V				22+ 5	0.3444	0.04	Q	
16+15	0.3154	0.17	Q	V				22+10	0.3446	0.04	Q	
16+20	0.3164	0.14	Q	V				22+15	0.3450	0.05	Q	
16+25	0.3172	0.12	Q	V				22+20	0.3453	0.05	Q	
16+30	0.3179	0.10	Q	V				22+25	0.3456	0.04	Q	
16+35	0.3185	0.09	Q	V				22+30	0.3458	0.04	Q	
16+40	0.3191	0.08	Q	V				22+35	0.3461	0.04	Q	
16+45	0.3196	0.07	Q	V				22+40	0.3463	0.04	Q	
16+50	0.3201	0.07	Q	V				22+45	0.3466	0.04	Q	
16+55	0.3205	0.06	Q	V				22+50	0.3468	0.04	Q	
17+ 0	0.3209	0.06	Q	V				22+55	0.3471	0.03	Q	
17+ 5	0.3213	0.06	Q	V				23+ 0	0.3473	0.03	Q	
17+10	0.3218	0.07	Q	V				23+ 5	0.3476	0.03	Q	
17+15	0.3223	0.07	Q	V				23+10	0.3478	0.03	Q	
17+20	0.3228	0.08	Q	V				23+15	0.3480	0.03	Q	
17+25	0.3234	0.08	Q	V				23+20	0.3483	0.03	Q	
17+30	0.3239	0.08	Q	V				23+25	0.3485	0.03	Q	
17+35	0.3245	0.08	Q	V				23+30	0.3487	0.03	Q	
17+40	0.3251	0.08	Q	V				23+35	0.3490	0.03	Q	
17+45	0.3256	0.08	Q	V				23+40	0.3492	0.03	Q	
17+50	0.3262	0.08	Q	V				23+45	0.3494	0.03	Q	

23+50	0.3497	0.03	Q	|	|	|	V|
23+55	0.3499	0.03	Q	|	|	|	V|
24+ 0	0.3501	0.03	Q	|	|	|	V|
24+ 5	0.3504	0.03	Q	|	|	|	V|
24+10	0.3505	0.02	Q	|	|	|	V|
24+15	0.3506	0.01	Q	|	|	|	V|
24+20	0.3507	0.01	Q	|	|	|	V|
24+25	0.3507	0.01	Q	|	|	|	V|
24+30	0.3507	0.00	Q	|	|	|	V|
24+35	0.3508	0.00	Q	|	|	|	V|
24+40	0.3508	0.00	Q	|	|	|	V|
24+45	0.3508	0.00	Q	|	|	|	V|
24+50	0.3508	0.00	Q	|	|	|	V|
24+55	0.3508	0.00	Q	|	|	|	V|
25+ 0	0.3508	0.00	Q	|	|	|	V|
25+ 5	0.3508	0.00	Q	|	|	|	V|
25+10	0.3508	0.00	Q	|	|	|	V|
25+15	0.3508	0.00	Q	|	|	|	V|

APPENDIX C.2: 5-YEAR STORM EVENT

1-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPRE15.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used
English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
EXISTING CONDITION
FN: ARAPRE

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areaal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(Ft.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.163 Hr.
Lag time = 9.75 Min.
25% of lag time = 2.44 Min.
40% of lag time = 3.90 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 0.45 5.17

100 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 1.20 13.80

STORM EVENT (YEAR) = 5.00
Area Averaged 2-Year Rainfall = 0.450(In)
Area Averaged 100-Year Rainfall = 1.200(In)
Point rain (area averaged) = 0.626(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 0.626(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 71.00 0.161
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
71.0	52.2	0.550	0.161	0.470	1.000	0.470
						Sum (F) = 0.470

Area averaged mean soil loss (F) (In/Hr) = 0.470
Minimum soil loss rate ((In/Hr)) = 0.235
(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.771

Slope of intensity-duration curve for a 1 hour storm = 0.5000

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period Time % of lag Distribution Unit Hydrograph
(hrs) Graph % (CFS)

1	0.083	51.266	6.366	0.738
2	0.167	102.533	27.222	3.155
3	0.250	153.799	28.703	3.327
4	0.333	205.065	12.516	1.451
5	0.417	256.331	6.680	0.774
6	0.500	307.598	4.653	0.539
7	0.583	358.864	3.341	0.387
8	0.667	410.130	2.524	0.293
9	0.750	461.397	1.836	0.213
10	0.833	512.663	1.556	0.180
11	0.917	563.929	1.237	0.143
12	1.000	615.195	0.968	0.112
13	1.083	666.462	0.758	0.088
14	1.167	717.728	0.560	0.065
15	1.250	768.994	0.513	0.059
16	1.333	820.260	0.566	0.066
			Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr)	Effective (In/Hr)
				Max | Low	
1	0.08	4.20	0.315	(0.470) 0.243	0.072
2	0.17	4.30	0.323	(0.470) 0.249	0.074
3	0.25	5.00	0.375	(0.470) 0.289	0.086
4	0.33	5.00	0.375	(0.470) 0.289	0.086
5	0.42	5.80	0.435	(0.470) 0.336	0.100
6	0.50	6.50	0.488	(0.470) 0.376	0.112
7	0.58	7.40	0.556	(0.470) 0.428	0.127
8	0.67	8.60	0.646	0.470 (0.498)	0.176
9	0.75	12.30	0.923	0.470 (0.712)	0.453
10	0.83	29.10	2.185	0.470 (1.685)	1.715
11	0.92	6.80	0.510	(0.470) 0.394	0.117
12	1.00	5.00	0.375	(0.470) 0.289	0.086

(Loss Rate Not Used)

Sum = 100.0 Sum = 3.2

Flood volume = Effective rainfall 0.27(In) times area 11.5(Ac.)/(1(In)/(Ft.)) = 0.3(Ac.Ft)

Total soil loss = 0.36(In)

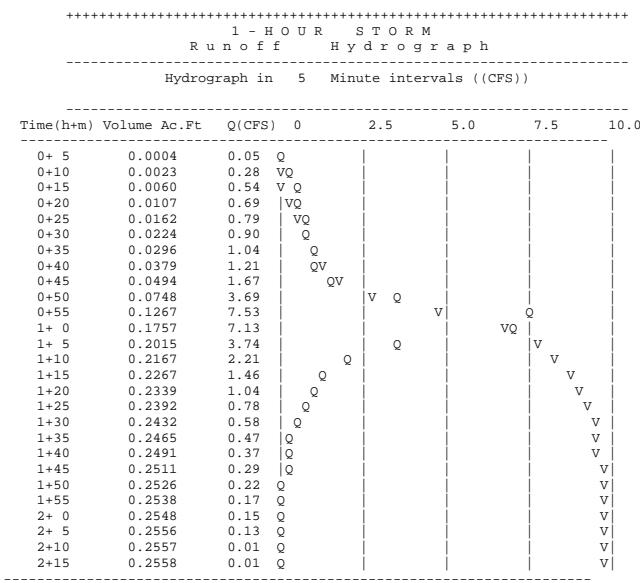
Total rainfall = 0.344(Ac.Ft)

Total rainfall = 0.63(In)

Flood volume = 11141.3 Cubic Feet

Total soil loss = 14974.5 Cubic Feet

Peak flow rate of this hydrograph = 7.527(CFS)



3-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPRE35.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16

UNIT HYDROGRAPH FOR AREA A

EXISTING CONDITION

FN: ARAPRE

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.

Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.

Length along longest watercourse = 3338.00(Ft.)

Length along longest watercourse measured to centroid = 1232.00(Ft.)

Length along longest watercourse = 0.632 Mi.

Length along longest watercourse measured to centroid = 0.233 Mi.

Difference in elevation = 34.70(Ft.)

Slope along watercourse = 54.8880 Ft./Mi.

Average Manning's 'N' = 0.030

Lag time = 0.163 Hr.

Lag time = 9.75 Min.

25% of lag time = 2.44 Min.

40% of lag time = 3.90 Min.

Unit time = 5.00 Min.

Duration of storm = 3 Hour(s)

User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	0.80	9.20

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.80	20.70

STORM EVENT (YEAR) = 5.00

Area Averaged 2-Year Rainfall = 0.800(In)

Area Averaged 100-Year Rainfall = 1.800(In)

Point rain (area averaged) = 1.034(In)

Areal adjustment factor = 99.99 %

Adjusted average point rain = 1.034(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.500	71.00	0.161

Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
71.0	52.2	0.550	0.161	0.470	1.000	0.470
					Sum (F)	0.470

Area averaged mean soil loss (F) (In/Hr) = 0.470

Minimum soil loss rate ((In/Hr)) = 0.235

(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.771

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	51.266	6.366	0.738
2	0.167	102.533	27.222	3.155
3	0.250	153.799	28.703	3.327
4	0.333	205.065	12.516	1.451
5	0.417	256.331	6.680	0.774
6	0.500	307.598	4.653	0.539
7	0.583	358.864	3.341	0.387
8	0.667	410.130	2.524	0.293
9	0.750	461.397	1.836	0.213
10	0.833	512.663	1.556	0.180
11	0.917	563.929	1.237	0.143
12	1.000	615.195	0.968	0.112
13	1.083	666.462	0.758	0.088
14	1.167	717.728	0.560	0.065
15	1.250	768.994	0.513	0.059
16	1.333	820.260	0.566	0.066
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective
(Hr.)	Percent	(In/Hr)	Max | Low	(In/Hr)	
1	0.08	1.30	0.161 | ( 0.470)	0.124 | 0.037	
2	0.17	1.30	0.161 | ( 0.470)	0.124 | 0.037	
3	0.25	1.10	0.137 | ( 0.470)	0.105 | 0.031	
4	0.33	1.50	0.186 | ( 0.470)	0.144 | 0.043	
5	0.42	1.50	0.186 | ( 0.470)	0.144 | 0.043	
6	0.50	1.80	0.223 | ( 0.470)	0.172 | 0.051	
7	0.58	1.50	0.186 | ( 0.470)	0.144 | 0.043	
8	0.67	1.80	0.223 | ( 0.470)	0.172 | 0.051	
9	0.75	1.80	0.223 | ( 0.470)	0.172 | 0.051	
10	0.83	1.50	0.186 | ( 0.470)	0.144 | 0.043	
11	0.92	1.60	0.199 | ( 0.470)	0.153 | 0.045	
12	1.00	1.80	0.223 | ( 0.470)	0.172 | 0.051	
13	1.08	2.20	0.273 | ( 0.470)	0.211 | 0.062	
14	1.17	2.20	0.273 | ( 0.470)	0.211 | 0.062	
15	1.25	2.20	0.273 | ( 0.470)	0.211 | 0.062	
16	1.33	2.00	0.248 | ( 0.470)	0.191 | 0.057	
17	1.42	2.60	0.323 | ( 0.470)	0.249 | 0.074	
18	1.50	2.70	0.335 | ( 0.470)	0.258 | 0.077	
19	1.58	2.40	0.298 | ( 0.470)	0.230 | 0.068	
20	1.67	2.70	0.335 | ( 0.470)	0.258 | 0.077	
21	1.75	3.30	0.410 | ( 0.470)	0.316 | 0.094	
22	1.83	3.10	0.385 | ( 0.470)	0.297 | 0.088	
23	1.92	2.90	0.360 | ( 0.470)	0.278 | 0.082	
24	2.00	3.00	0.372 | ( 0.470)	0.287 | 0.085	
25	2.08	3.10	0.385 | ( 0.470)	0.297 | 0.088	
26	2.17	4.20	0.521 | ( 0.470)	0.402 | 0.119	

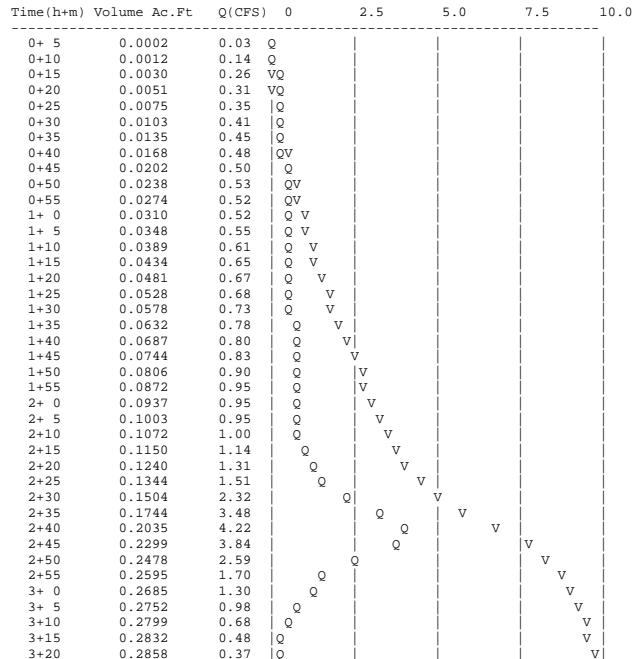
27	2.25	5.00	0.621	0.470	(0.479)	0.151	3+25	0.2877	0.29	|Q	|	|	|	V|
28	2.33	3.50	0.434	(0.470)	0.335	0.099	3+30	0.2892	0.22	Q	|	|	|	V|
29	2.42	6.80	0.844	0.470	(0.651)	0.374	3+35	0.2904	0.17	Q	|	|	|	V|
30	2.50	7.30	0.906	0.470	(0.699)	0.436	3+40	0.2913	0.14	Q	|	|	|	V|
31	2.58	8.20	1.018	0.470	(0.785)	0.548	3+45	0.2920	0.10	Q	|	|	|	V|
32	2.67	5.90	0.732	0.470	(0.565)	0.262	3+50	0.2925	0.07	Q	|	|	|	V|
33	2.75	2.00	0.248	(0.470)	0.191	0.057	3+55	0.2927	0.03	Q	|	|	|	V|
34	2.83	1.80	0.223	(0.470)	0.172	0.051	4+ 0	0.2928	0.01	Q	|	|	|	V|
35	2.92	1.80	0.223	(0.470)	0.172	0.051	4+ 5	0.2928	0.01	Q	|	|	|	V|
36	3.00	0.60	0.074	(0.470)	0.057	0.017	4+10	0.2929	0.00	Q	|	|	|	V|
(Loss Rate Not Used)														
Sum =	100.0						4+15	0.2929	0.00	Q	|	|	|	V

Flood volume = Effective rainfall 0.31(In)
times area 11.5(Ac.)/[(In)/(Ft.)] = 0.3(Ac.Ft)
Total soil loss = 0.73(In)
Total soil loss = 0.698(Ac.Ft)
Total rainfall = 1.03(In)
Flood volume = 12757.4 Cubic Feet
Total soil loss = 30414.1 Cubic Feet

Peak flow rate of this hydrograph = 4.223(CFS)

+++++ 3 - H O U R S T O R M Hydrograph -----
Run off Hydrograph

Hydrograph in 5 Minute intervals ((CFS))



6-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPRE65.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16

UNIT HYDROGRAPH FOR AREA A
EXISTING CONDITION

FN: ARAPRE

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(Ft.)
Slope along watercourse = 54.8880 Ft./Mi.

Average Manning's 'N' = 0.030

Lag time = 0.163 Hr.

Lag time = 9.75 Min.

25% of lag time = 2.44 Min.

40% of lag time = 3.90 Min.

Unit time = 5.00 Min.

Duration of storm = 6 Hour(s)

User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.00	11.50

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	2.50	28.75

STORM EVENT (YEAR) = 5.00
Area Averaged 2-Year Rainfall = 1.000(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 1.351(In)
Areal adjustment factor = 100.00 %

Adjusted average point rain = 1.351(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.500	71.00	0.161

Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
71.0	52.2	0.550	0.161	0.470	1.000	0.470
					Sum (F)	0.470

Area averaged mean soil loss (F) (In/Hr) = 0.470

Minimum soil loss rate ((In/Hr)) = 0.235

(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.771

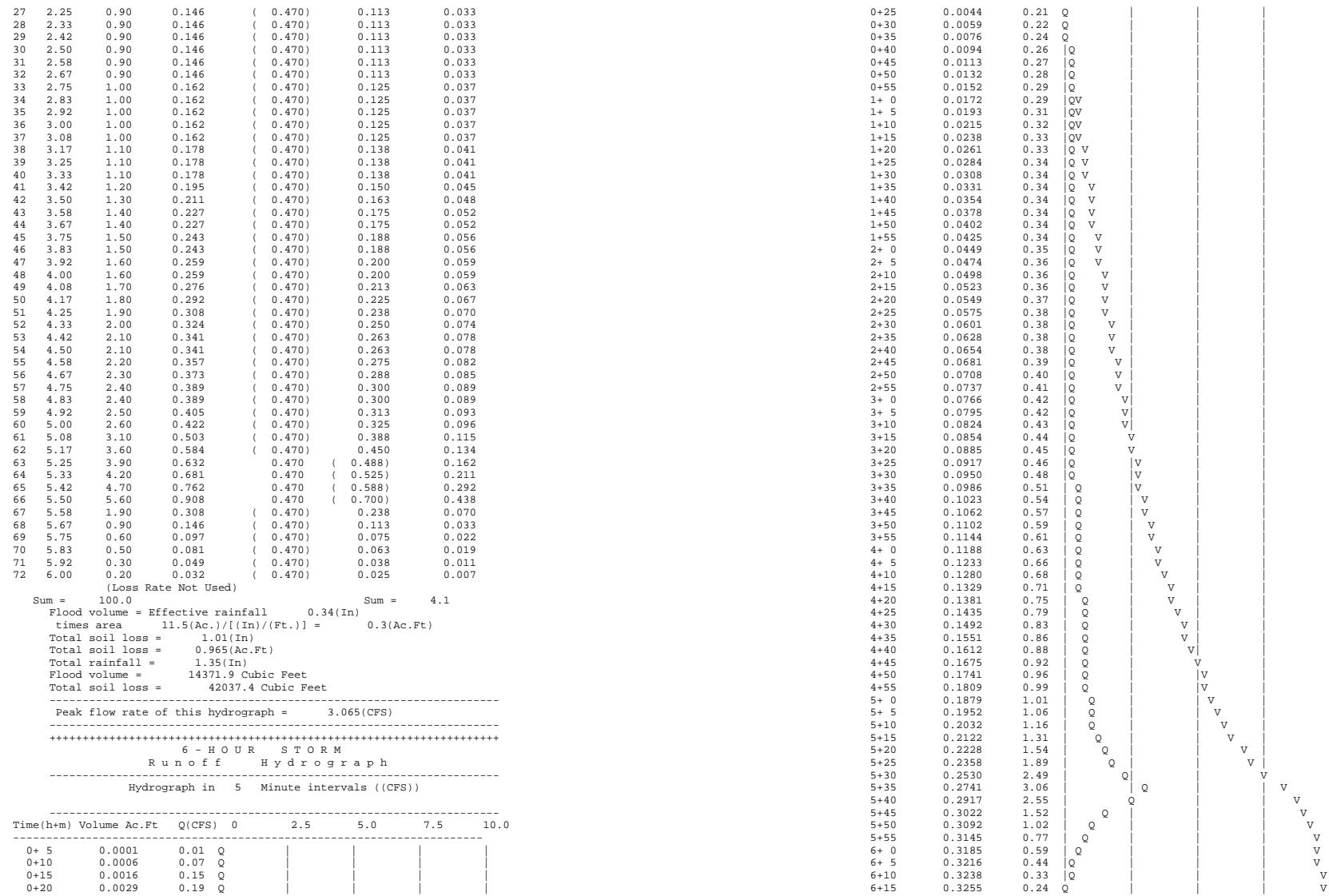
Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	51.266	6.366	0.738
2	0.167	102.533	27.222	3.155
3	0.250	153.799	28.703	3.327
4	0.333	205.065	12.516	1.451
5	0.417	256.331	6.680	0.774
6	0.500	307.598	4.653	0.539
7	0.583	358.864	3.341	0.387
8	0.667	410.130	2.524	0.293
9	0.750	461.397	1.836	0.213
10	0.833	512.663	1.556	0.180
11	0.917	563.929	1.237	0.143
12	1.000	615.195	0.968	0.112
13	1.083	666.462	0.758	0.088
14	1.167	717.728	0.560	0.065
15	1.250	768.994	0.513	0.059
16	1.333	820.260	0.566	0.066
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective
(Hr.)	Percent	(In/Hr)		Max | Low	(In/Hr)
1	0.08	0.50	0.081	(0.470) | 0.063	0.019
2	0.17	0.60	0.097	(0.470) | 0.075	0.022
3	0.25	0.60	0.097	(0.470) | 0.075	0.022
4	0.33	0.60	0.097	(0.470) | 0.075	0.022
5	0.42	0.60	0.097	(0.470) | 0.075	0.022
6	0.50	0.70	0.114	(0.470) | 0.088	0.026
7	0.58	0.70	0.114	(0.470) | 0.088	0.026
8	0.67	0.70	0.114	(0.470) | 0.088	0.026
9	0.75	0.70	0.114	(0.470) | 0.088	0.026
10	0.83	0.70	0.114	(0.470) | 0.088	0.026
11	0.92	0.70	0.114	(0.470) | 0.088	0.026
12	1.00	0.80	0.130	(0.470) | 0.100	0.030
13	1.08	0.80	0.130	(0.470) | 0.100	0.030
14	1.17	0.80	0.130	(0.470) | 0.100	0.030
15	1.25	0.80	0.130	(0.470) | 0.100	0.030
16	1.33	0.80	0.130	(0.470) | 0.100	0.030
17	1.42	0.80	0.130	(0.470) | 0.100	0.030
18	1.50	0.80	0.130	(0.470) | 0.100	0.030
19	1.58	0.80	0.130	(0.470) | 0.100	0.030
20	1.67	0.80	0.130	(0.470) | 0.100	0.030
21	1.75	0.80	0.130	(0.470) | 0.100	0.030
22	1.83	0.80	0.130	(0.470) | 0.100	0.030
23	1.92	0.80	0.130	(0.470) | 0.100	0.030
24	2.00	0.90	0.146	(0.470) | 0.113	0.033
25	2.08	0.80	0.130	(0.470) | 0.100	0.030
26	2.17	0.90	0.146	(0.470) | 0.113	0.033



6+20	0.3268	0.19	Q	|	|	|	V|
6+25	0.3277	0.14	Q	|	|	|	V|
6+30	0.3285	0.11	Q	|	|	|	V|
6+35	0.3290	0.08	Q	|	|	|	V|
6+40	0.3295	0.06	Q	|	|	|	V|
6+45	0.3298	0.04	Q	|	|	|	V|
6+50	0.3298	0.01	Q	|	|	|	V|
6+55	0.3299	0.01	Q	|	|	|	V|
7+ 0	0.3299	0.00	Q	|	|	|	V|
7+ 5	0.3299	0.00	Q	|	|	|	V|
7+10	0.3299	0.00	Q				V
7+15	0.3299	0.00	Q				V

24-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPRE245.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

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UNIT HYDROGRAPH FOR AREA A

EXISTING CONDITION

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Average Manning's 'N' = 0.030

Lag time = 0.163 Hr.

Lag time = 9.75 Min.

25% of lag time = 2.44 Min.

40% of lag time = 3.90 Min.

Unit time = 5.00 Min.

Duration of storm = 24 Hour(s)

User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.60	18.40

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	4.10	47.15

STORM EVENT (YEAR) = 5.00

Area Averaged 2-Year Rainfall = 1.600(In)

Area Averaged 100-Year Rainfall = 4.100(In)

Point rain (area averaged) = 2.186(In)

Areal adjustment factor = 100.00 %

Adjusted average point rain = 2.186(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.500	71.00	0.161

Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
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Minimum soil loss rate ((In/Hr)) = 0.235

(for 24 hour storm duration)

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Unit Hydrograph VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
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8	0.667	410.130	2.524
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10	0.833	512.663	1.556
11	0.917	563.929	1.237
12	1.000	615.195	0.968
13	1.083	666.462	0.758
14	1.167	717.728	0.560
15	1.250	768.994	0.513
16	1.333	820.260	0.566
		Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective
(Hr.)	Percent	(In/Hr)	Max | Low	(In/Hr)	
1	0.08	0.07	0.017 (0.833)	0.013	0.004
2	0.17	0.07	0.017 (0.830)	0.013	0.004
3	0.25	0.07	0.017 (0.827)	0.013	0.004
4	0.33	0.10	0.026 (0.823)	0.020	0.006
5	0.42	0.10	0.026 (0.820)	0.020	0.006
6	0.50	0.10	0.026 (0.817)	0.020	0.006
7	0.58	0.10	0.026 (0.814)	0.020	0.006
8	0.67	0.10	0.026 (0.811)	0.020	0.006
9	0.75	0.10	0.026 (0.807)	0.020	0.006
10	0.83	0.13	0.035 (0.804)	0.027	0.008
11	0.92	0.13	0.035 (0.801)	0.027	0.008
12	1.00	0.13	0.035 (0.798)	0.027	0.008
13	1.08	0.10	0.026 (0.795)	0.020	0.006
14	1.17	0.10	0.026 (0.792)	0.020	0.006
15	1.25	0.10	0.026 (0.789)	0.020	0.006
16	1.33	0.10	0.026 (0.785)	0.020	0.006
17	1.42	0.10	0.026 (0.782)	0.020	0.006
18	1.50	0.10	0.026 (0.779)	0.020	0.006
19	1.58	0.10	0.026 (0.776)	0.020	0.006
20	1.67	0.10	0.026 (0.773)	0.020	0.006
21	1.75	0.10	0.026 (0.770)	0.020	0.006
22	1.83	0.13	0.035 (0.767)	0.027	0.008
23	1.92	0.13	0.035 (0.764)	0.027	0.008
24	2.00	0.13	0.035 (0.761)	0.027	0.008
25	2.08	0.13	0.035 (0.757)	0.027	0.008
26	2.17	0.13	0.035 (0.754)	0.027	0.008

27	2.25	0.13	0.035	(0.751)	0.027	0.008	98	8.17	0.50	0.131	(0.551)	0.101	0.030
28	2.33	0.13	0.035	(0.748)	0.027	0.008	99	8.25	0.50	0.131	(0.548)	0.101	0.030
29	2.42	0.13	0.035	(0.745)	0.027	0.008	100	8.33	0.50	0.131	(0.546)	0.101	0.030
30	2.50	0.13	0.035	(0.742)	0.027	0.008	101	8.42	0.50	0.131	(0.543)	0.101	0.030
31	2.58	0.17	0.044	(0.739)	0.034	0.010	102	8.50	0.50	0.131	(0.541)	0.101	0.030
32	2.67	0.17	0.044	(0.736)	0.034	0.010	103	8.58	0.53	0.140	(0.538)	0.108	0.032
33	2.75	0.17	0.044	(0.733)	0.034	0.010	104	8.67	0.53	0.140	(0.536)	0.108	0.032
34	2.83	0.17	0.044	(0.730)	0.034	0.010	105	8.75	0.53	0.140	(0.533)	0.108	0.032
35	2.92	0.17	0.044	(0.727)	0.034	0.010	106	8.83	0.57	0.149	(0.531)	0.115	0.034
36	3.00	0.17	0.044	(0.724)	0.034	0.010	107	8.92	0.57	0.149	(0.528)	0.115	0.034
37	3.08	0.17	0.044	(0.721)	0.034	0.010	108	9.00	0.57	0.149	(0.526)	0.115	0.034
38	3.17	0.17	0.044	(0.718)	0.034	0.010	109	9.08	0.63	0.166	(0.523)	0.128	0.038
39	3.25	0.17	0.044	(0.715)	0.034	0.010	110	9.17	0.63	0.166	(0.521)	0.128	0.038
40	3.33	0.17	0.044	(0.712)	0.034	0.010	111	9.25	0.63	0.166	(0.518)	0.128	0.038
41	3.42	0.17	0.044	(0.709)	0.034	0.010	112	9.33	0.67	0.175	(0.516)	0.135	0.040
42	3.50	0.17	0.044	(0.706)	0.034	0.010	113	9.42	0.67	0.175	(0.513)	0.135	0.040
43	3.58	0.17	0.044	(0.703)	0.034	0.010	114	9.50	0.67	0.175	(0.511)	0.135	0.040
44	3.67	0.17	0.044	(0.700)	0.034	0.010	115	9.58	0.70	0.184	(0.508)	0.142	0.042
45	3.75	0.17	0.044	(0.697)	0.034	0.010	116	9.67	0.70	0.184	(0.506)	0.142	0.042
46	3.83	0.20	0.052	(0.694)	0.040	0.012	117	9.75	0.70	0.184	(0.503)	0.142	0.042
47	3.92	0.20	0.052	(0.691)	0.040	0.012	118	9.83	0.73	0.192	(0.501)	0.148	0.044
48	4.00	0.20	0.052	(0.688)	0.040	0.012	119	9.92	0.73	0.192	(0.499)	0.148	0.044
49	4.08	0.20	0.052	(0.686)	0.040	0.012	120	10.00	0.73	0.192	(0.496)	0.148	0.044
50	4.17	0.20	0.052	(0.683)	0.040	0.012	121	10.08	0.50	0.131	(0.494)	0.101	0.030
51	4.25	0.20	0.052	(0.680)	0.040	0.012	122	10.17	0.50	0.131	(0.491)	0.101	0.030
52	4.33	0.23	0.061	(0.677)	0.047	0.014	123	10.25	0.50	0.131	(0.489)	0.101	0.030
53	4.42	0.23	0.061	(0.674)	0.047	0.014	124	10.33	0.50	0.131	(0.487)	0.101	0.030
54	4.50	0.23	0.061	(0.671)	0.047	0.014	125	10.42	0.50	0.131	(0.484)	0.101	0.030
55	4.58	0.23	0.061	(0.668)	0.047	0.014	126	10.50	0.50	0.131	(0.482)	0.101	0.030
56	4.67	0.23	0.061	(0.665)	0.047	0.014	127	10.58	0.67	0.175	(0.480)	0.135	0.040
57	4.75	0.23	0.061	(0.662)	0.047	0.014	128	10.67	0.67	0.175	(0.477)	0.135	0.040
58	4.83	0.27	0.070	(0.660)	0.054	0.016	129	10.75	0.67	0.175	(0.475)	0.135	0.040
59	4.92	0.27	0.070	(0.657)	0.054	0.016	130	10.83	0.67	0.175	(0.473)	0.135	0.040
60	5.00	0.27	0.070	(0.654)	0.054	0.016	131	10.92	0.67	0.175	(0.470)	0.135	0.040
61	5.08	0.20	0.052	(0.651)	0.040	0.012	132	11.00	0.67	0.175	(0.468)	0.135	0.040
62	5.17	0.20	0.052	(0.648)	0.040	0.012	133	11.08	0.63	0.166	(0.466)	0.128	0.038
63	5.25	0.20	0.052	(0.645)	0.040	0.012	134	11.17	0.63	0.166	(0.463)	0.128	0.038
64	5.33	0.23	0.061	(0.643)	0.047	0.014	135	11.25	0.63	0.166	(0.461)	0.128	0.038
65	5.42	0.23	0.061	(0.640)	0.047	0.014	136	11.33	0.63	0.166	(0.459)	0.128	0.038
66	5.50	0.23	0.061	(0.637)	0.047	0.014	137	11.42	0.63	0.166	(0.457)	0.128	0.038
67	5.58	0.27	0.070	(0.634)	0.054	0.016	138	11.50	0.63	0.166	(0.454)	0.128	0.038
68	5.67	0.27	0.070	(0.631)	0.054	0.016	139	11.58	0.57	0.149	(0.452)	0.115	0.034
69	5.75	0.27	0.070	(0.629)	0.054	0.016	140	11.67	0.57	0.149	(0.450)	0.115	0.034
70	5.83	0.27	0.070	(0.626)	0.054	0.016	141	11.75	0.57	0.149	(0.448)	0.115	0.034
71	5.92	0.27	0.070	(0.623)	0.054	0.016	142	11.83	0.60	0.157	(0.445)	0.121	0.036
72	6.00	0.27	0.070	(0.620)	0.054	0.016	143	11.92	0.60	0.157	(0.443)	0.121	0.036
73	6.08	0.30	0.079	(0.618)	0.061	0.018	144	12.00	0.60	0.157	(0.441)	0.121	0.036
74	6.17	0.30	0.079	(0.615)	0.061	0.018	145	12.08	0.83	0.219	(0.439)	0.169	0.050
75	6.25	0.30	0.079	(0.612)	0.061	0.018	146	12.17	0.83	0.219	(0.436)	0.169	0.050
76	6.33	0.30	0.079	(0.609)	0.061	0.018	147	12.25	0.83	0.219	(0.434)	0.169	0.050
77	6.42	0.30	0.079	(0.607)	0.061	0.018	148	12.33	0.87	0.227	(0.432)	0.175	0.052
78	6.50	0.30	0.079	(0.604)	0.061	0.018	149	12.42	0.87	0.227	(0.430)	0.175	0.052
79	6.58	0.33	0.087	(0.601)	0.067	0.020	150	12.50	0.87	0.227	(0.428)	0.175	0.052
80	6.67	0.33	0.087	(0.598)	0.067	0.020	151	12.58	0.93	0.245	(0.426)	0.189	0.056
81	6.75	0.33	0.087	(0.596)	0.067	0.020	152	12.67	0.93	0.245	(0.423)	0.189	0.056
82	6.83	0.33	0.087	(0.593)	0.067	0.020	153	12.75	0.93	0.245	(0.421)	0.189	0.056
83	6.92	0.33	0.087	(0.590)	0.067	0.020	154	12.83	0.97	0.254	(0.419)	0.196	0.058
84	7.00	0.33	0.087	(0.588)	0.067	0.020	155	12.92	0.97	0.254	(0.417)	0.196	0.058
85	7.08	0.33	0.087	(0.585)	0.067	0.020	156	13.00	0.97	0.254	(0.415)	0.196	0.058
86	7.17	0.33	0.087	(0.582)	0.067	0.020	157	13.08	1.13	0.297	(0.413)	0.229	0.068
87	7.25	0.33	0.087	(0.580)	0.067	0.020	158	13.17	1.13	0.297	(0.411)	0.229	0.068
88	7.33	0.37	0.096	(0.577)	0.074	0.022	159	13.25	1.13	0.297	(0.409)	0.229	0.068
89	7.42	0.37	0.096	(0.574)	0.074	0.022	160	13.33	1.13	0.297	(0.407)	0.229	0.068
90	7.50	0.37	0.096	(0.572)	0.074	0.022	161	13.42	1.13	0.297	(0.405)	0.229	0.068
91	7.58	0.40	0.105	(0.569)	0.081	0.024	162	13.50	1.13	0.297	(0.403)	0.229	0.068
92	7.67	0.40	0.105	(0.567)	0.081	0.024	163	13.58	0.77	0.201	(0.400)	0.155	0.046
93	7.75	0.40	0.105	(0.564)	0.081	0.024	164	13.67	0.77	0.201	(0.398)	0.155	0.046
94	7.83	0.43	0.114	(0.561)	0.088	0.026	165	13.75	0.77	0.201	(0.396)	0.155	0.046
95	7.92	0.43	0.114	(0.559)	0.088	0.026	166	13.83	0.77	0.201	(0.394)	0.155	0.046
96	8.00	0.43	0.114	(0.556)	0.088	0.026	167	13.92	0.77	0.201	(0.392)	0.155	0.046
97	8.08	0.50	0.131	(0.554)	0.101	0.030	168	14.00	0.77	0.201	(0.390)	0.155	0.046

169	14.08	0.90	0.236	(0.388)	0.182	0.054			240	20.00	0.07	0.017	(0.273)	0.013	0.004
170	14.17	0.90	0.236	(0.386)	0.182	0.054			241	20.08	0.10	0.026	(0.272)	0.020	0.006
171	14.25	0.90	0.236	(0.384)	0.182	0.054			242	20.17	0.10	0.026	(0.270)	0.020	0.006
172	14.33	0.87	0.227	(0.382)	0.175	0.052			243	20.25	0.10	0.026	(0.269)	0.020	0.006
173	14.42	0.87	0.227	(0.380)	0.175	0.052			244	20.33	0.10	0.026	(0.268)	0.020	0.006
174	14.50	0.87	0.227	(0.379)	0.175	0.052			245	20.42	0.10	0.026	(0.267)	0.020	0.006
175	14.58	0.87	0.227	(0.377)	0.175	0.052			246	20.50	0.10	0.026	(0.266)	0.020	0.006
176	14.67	0.87	0.227	(0.375)	0.175	0.052			247	20.58	0.10	0.026	(0.265)	0.020	0.006
177	14.75	0.87	0.227	(0.373)	0.175	0.052			248	20.67	0.10	0.026	(0.264)	0.020	0.006
178	14.83	0.83	0.219	(0.371)	0.169	0.050			249	20.75	0.10	0.026	(0.263)	0.020	0.006
179	14.92	0.83	0.219	(0.369)	0.169	0.050			250	20.83	0.07	0.017	(0.261)	0.013	0.004
180	15.00	0.83	0.219	(0.367)	0.169	0.050			251	20.92	0.07	0.017	(0.260)	0.013	0.004
181	15.08	0.80	0.210	(0.365)	0.162	0.048			252	21.00	0.07	0.017	(0.259)	0.013	0.004
182	15.17	0.80	0.210	(0.363)	0.162	0.048			253	21.08	0.10	0.026	(0.258)	0.020	0.006
183	15.25	0.80	0.210	(0.361)	0.162	0.048			254	21.17	0.10	0.026	(0.257)	0.020	0.006
184	15.33	0.77	0.201	(0.360)	0.155	0.046			255	21.25	0.10	0.026	(0.256)	0.020	0.006
185	15.42	0.77	0.201	(0.358)	0.155	0.046			256	21.33	0.07	0.017	(0.255)	0.013	0.004
186	15.50	0.77	0.201	(0.356)	0.155	0.046			257	21.42	0.07	0.017	(0.254)	0.013	0.004
187	15.58	0.63	0.166	(0.354)	0.128	0.038			258	21.50	0.07	0.017	(0.253)	0.013	0.004
188	15.67	0.63	0.166	(0.352)	0.128	0.038			259	21.58	0.10	0.026	(0.253)	0.020	0.006
189	15.75	0.63	0.166	(0.350)	0.128	0.038			260	21.67	0.10	0.026	(0.252)	0.020	0.006
190	15.83	0.63	0.166	(0.349)	0.128	0.038			261	21.75	0.10	0.026	(0.251)	0.020	0.006
191	15.92	0.63	0.166	(0.347)	0.128	0.038			262	21.83	0.07	0.017	(0.250)	0.013	0.004
192	16.00	0.63	0.166	(0.345)	0.128	0.038			263	21.92	0.07	0.017	(0.249)	0.013	0.004
193	16.08	0.13	0.035	(0.343)	0.027	0.008			264	22.00	0.07	0.017	(0.248)	0.013	0.004
194	16.17	0.13	0.035	(0.342)	0.027	0.008			265	22.08	0.10	0.026	(0.247)	0.020	0.006
195	16.25	0.13	0.035	(0.340)	0.027	0.008			266	22.17	0.10	0.026	(0.246)	0.020	0.006
196	16.33	0.13	0.035	(0.338)	0.027	0.008			267	22.25	0.10	0.026	(0.246)	0.020	0.006
197	16.42	0.13	0.035	(0.336)	0.027	0.008			268	22.33	0.07	0.017	(0.245)	0.013	0.004
198	16.50	0.13	0.035	(0.335)	0.027	0.008			269	22.42	0.07	0.017	(0.244)	0.013	0.004
199	16.58	0.10	0.026	(0.333)	0.020	0.006			270	22.50	0.07	0.017	(0.243)	0.013	0.004
200	16.67	0.10	0.026	(0.331)	0.020	0.006			271	22.58	0.07	0.017	(0.243)	0.013	0.004
201	16.75	0.10	0.026	(0.330)	0.020	0.006			272	22.67	0.07	0.017	(0.242)	0.013	0.004
202	16.83	0.10	0.026	(0.328)	0.020	0.006			273	22.75	0.07	0.017	(0.241)	0.013	0.004
203	16.92	0.10	0.026	(0.326)	0.020	0.006			274	22.83	0.07	0.017	(0.241)	0.013	0.004
204	17.00	0.10	0.026	(0.325)	0.020	0.006			275	22.92	0.07	0.017	(0.240)	0.013	0.004
205	17.08	0.17	0.044	(0.323)	0.034	0.010			276	23.00	0.07	0.017	(0.240)	0.013	0.004
206	17.17	0.17	0.044	(0.321)	0.034	0.010			277	23.08	0.07	0.017	(0.239)	0.013	0.004
207	17.25	0.17	0.044	(0.320)	0.034	0.010			278	23.17	0.07	0.017	(0.239)	0.013	0.004
208	17.33	0.17	0.044	(0.318)	0.034	0.010			279	23.25	0.07	0.017	(0.238)	0.013	0.004
209	17.42	0.17	0.044	(0.317)	0.034	0.010			280	23.33	0.07	0.017	(0.238)	0.013	0.004
210	17.50	0.17	0.044	(0.315)	0.034	0.010			281	23.42	0.07	0.017	(0.237)	0.013	0.004
211	17.58	0.17	0.044	(0.313)	0.034	0.010			282	23.50	0.07	0.017	(0.237)	0.013	0.004
212	17.67	0.17	0.044	(0.312)	0.034	0.010			283	23.58	0.07	0.017	(0.236)	0.013	0.004
213	17.75	0.17	0.044	(0.310)	0.034	0.010			284	23.67	0.07	0.017	(0.236)	0.013	0.004
214	17.83	0.13	0.035	(0.309)	0.027	0.008			285	23.75	0.07	0.017	(0.236)	0.013	0.004
215	17.92	0.13	0.035	(0.307)	0.027	0.008			286	23.83	0.07	0.017	(0.235)	0.013	0.004
216	18.00	0.13	0.035	(0.306)	0.027	0.008			287	23.92	0.07	0.017	(0.235)	0.013	0.004
217	18.08	0.13	0.035	(0.304)	0.027	0.008			288	24.00	0.07	0.017	(0.235)	0.013	0.004
218	18.17	0.13	0.035	(0.303)	0.027	0.008									
219	18.25	0.13	0.035	(0.301)	0.027	0.008									
220	18.33	0.13	0.035	(0.300)	0.027	0.008									
221	18.42	0.13	0.035	(0.298)	0.027	0.008									
222	18.50	0.13	0.035	(0.297)	0.027	0.008									
223	18.58	0.10	0.026	(0.295)	0.020	0.006									
224	18.67	0.10	0.026	(0.294)	0.020	0.006									
225	18.75	0.10	0.026	(0.293)	0.020	0.006									
226	18.83	0.07	0.017	(0.291)	0.013	0.004									
227	18.92	0.07	0.017	(0.290)	0.013	0.004									
228	19.00	0.07	0.017	(0.288)	0.013	0.004									
229	19.08	0.10	0.026	(0.287)	0.020	0.006									
230	19.17	0.10	0.026	(0.286)	0.020	0.006									
231	19.25	0.10	0.026	(0.284)	0.020	0.006									
232	19.33	0.13	0.035	(0.283)	0.027	0.008									
233	19.42	0.13	0.035	(0.282)	0.027	0.008									
234	19.50	0.13	0.035	(0.280)	0.027	0.008									
235	19.58	0.10	0.026	(0.279)	0.020	0.006									
236	19.67	0.10	0.026	(0.278)	0.020	0.006									
237	19.75	0.10	0.026	(0.277)	0.020	0.006									
238	19.83	0.07	0.017	(0.275)	0.013	0.004									
239	19.92	0.07	0.017	(0.274)	0.013	0.004									

(Loss Rate Not Used)

Sum = 100.0 Sum = 6.0

Flood volume = Effective rainfall 0.50(In) times area 11.5(Ac.)/(l(In)/(Ft.)) = 0.5(Ac.Ft)

Total soil loss = 1.69(In)

Total soil loss = 1.615(Ac.Ft)

Total rainfall = 2.19(In)

Flood volume = 20874.4 Cubic Feet

Total soil loss = 70359.8 Cubic Feet

Peak flow rate of this hydrograph = 0.770(CFS)

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24 - H O U R S T O R M
Runoff Hydrograph
Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+	5	0.0000	0.00	Q	0	1	1

0+10	0.0001	0.02	Q
0+15	0.0003	0.03	Q
0+20	0.0006	0.04	Q
0+25	0.0009	0.05	Q
0+30	0.0013	0.05	Q
0+35	0.0017	0.06	Q
0+40	0.0021	0.06	Q
0+45	0.0025	0.06	Q
0+50	0.0030	0.07	Q
0+55	0.0035	0.07	Q
1+ 0	0.0041	0.08	Q
1+ 5	0.0046	0.08	Q
1+10	0.0052	0.08	Q
1+15	0.0057	0.07	Q
1+20	0.0062	0.07	Q
1+25	0.0067	0.07	Q
1+30	0.0072	0.07	Q
1+35	0.0077	0.07	Q
1+40	0.0082	0.07	Q
1+45	0.0086	0.07	Q
1+50	0.0091	0.07	Q
1+55	0.0097	0.08	Q
2+ 0	0.0103	0.08	Q
2+ 5	0.0109	0.09	Q
2+10	0.0115	0.09	Q
2+15	0.0121	0.09	QV
2+20	0.0127	0.09	QV
2+25	0.0133	0.09	QV
2+30	0.0140	0.09	QV
2+35	0.0146	0.09	QV
2+40	0.0153	0.10	QV
2+45	0.0160	0.11	QV
2+50	0.0168	0.11	QV
2+55	0.0175	0.11	QV
3+ 0	0.0183	0.11	QV
3+ 5	0.0191	0.11	QV
3+10	0.0199	0.11	QV
3+15	0.0207	0.11	QV
3+20	0.0215	0.11	QV
3+25	0.0223	0.12	QV
3+30	0.0231	0.12	QV
3+35	0.0239	0.12	QV
3+40	0.0247	0.12	Q V
3+45	0.0254	0.12	Q V
3+50	0.0263	0.12	Q V
3+55	0.0271	0.12	Q V
4+ 0	0.0280	0.13	Q V
4+ 5	0.0289	0.13	Q V
4+10	0.0299	0.13	Q V
4+15	0.0308	0.14	Q V
4+20	0.0317	0.14	Q V
4+25	0.0327	0.15	Q V
4+30	0.0338	0.15	Q V
4+35	0.0349	0.16	Q V
4+40	0.0359	0.16	Q V
4+45	0.0370	0.16	Q V
4+50	0.0381	0.16	Q V
4+55	0.0393	0.17	Q V
5+ 0	0.0405	0.18	Q V
5+ 5	0.0417	0.18	Q V
5+10	0.0429	0.16	Q V
5+15	0.0439	0.15	Q V
5+20	0.0449	0.15	Q V
5+25	0.0460	0.15	Q V
5+30	0.0471	0.16	Q V
5+35	0.0482	0.16	Q V
5+40	0.0494	0.17	Q V
5+45	0.0506	0.18	Q V
5+50	0.0518	0.18	Q V
5+55	0.0531	0.18	Q V
6+ 0	0.0543	0.18	Q V

6+ 5	0.0556	0.18	Q V
6+10	0.0569	0.19	Q V
6+15	0.0583	0.20	Q V
6+20	0.0596	0.20	Q V
6+25	0.0610	0.20	Q V
6+30	0.0625	0.20	Q V
6+35	0.0639	0.21	Q V
6+40	0.0654	0.21	Q V
6+45	0.0669	0.22	Q V
6+50	0.0684	0.23	Q V
6+55	0.0700	0.23	Q V
7+ 0	0.0716	0.23	Q V
7+ 5	0.0731	0.23	Q V
7+10	0.0747	0.23	Q V
7+15	0.0763	0.23	Q V
7+20	0.0779	0.23	Q V
7+25	0.0796	0.24	Q V
7+30	0.0813	0.25	Q V
7+35	0.0830	0.25	|Q V
7+40	0.0848	0.26	|Q V
7+45	0.0866	0.27	|Q V
7+50	0.0885	0.27	|Q V
7+55	0.0904	0.28	|Q V
8+ 0	0.0924	0.29	|Q V
8+ 5	0.0944	0.30	|Q V
8+10	0.0965	0.31	|Q V
8+15	0.0988	0.33	|Q V
8+20	0.1011	0.33	|Q V
8+25	0.1034	0.34	|Q V
8+30	0.1057	0.34	|Q V
8+35	0.1081	0.34	|Q V
8+40	0.1105	0.35	|Q V
8+45	0.1130	0.36	|Q V
8+50	0.1155	0.36	|Q V
8+55	0.1181	0.37	|Q V
9+ 0	0.1207	0.38	|Q V
9+ 5	0.1234	0.39	|Q V
9+10	0.1261	0.40	|Q V
9+15	0.1290	0.42	|Q V
9+20	0.1320	0.43	|Q V
9+25	0.1350	0.44	|Q V
9+30	0.1380	0.45	|Q V
9+35	0.1412	0.45	|Q V
9+40	0.1443	0.46	|Q V
9+45	0.1476	0.47	|Q V
9+50	0.1509	0.48	|Q V
9+55	0.1542	0.49	|Q V
10+ 0	0.1577	0.50	|Q V
10+ 5	0.1610	0.49	|Q V
10+10	0.1641	0.45	|Q V
10+15	0.1669	0.40	|Q V
10+20	0.1695	0.38	|Q V
10+25	0.1721	0.38	|Q V
10+30	0.1747	0.37	|Q V
10+35	0.1772	0.37	|Q V
10+40	0.1800	0.40	|Q V
10+45	0.1829	0.43	|Q V
10+50	0.1860	0.44	|Q V
10+55	0.1890	0.45	|Q V
11+ 0	0.1922	0.45	|Q V
11+ 5	0.1953	0.45	|Q V
11+10	0.1984	0.45	|Q V
11+15	0.2014	0.44	|Q V
11+20	0.2045	0.44	|Q V
11+25	0.2075	0.44	|Q V
11+30	0.2105	0.44	|Q V
11+35	0.2135	0.44	|Q V
11+40	0.2165	0.43	|Q V
11+45	0.2193	0.41	|Q V
11+50	0.2221	0.41	|Q V
11+55	0.2250	0.41	|Q V

12+ 0	0.2278	0.42	Q	V				17+55	0.4463	0.11	Q	
12+ 5	0.2308	0.43	Q	V				18+ 0	0.4470	0.10	Q	
12+10	0.2340	0.47	Q	V				18+ 5	0.4477	0.10	Q	
12+15	0.2376	0.52	Q	V				18+10	0.4483	0.10	Q	
12+20	0.2413	0.54	Q	V				18+15	0.4490	0.10	Q	
12+25	0.2452	0.56	Q	V				18+20	0.4497	0.10	Q	
12+30	0.2491	0.57	Q	V				18+25	0.4503	0.09	Q	
12+35	0.2531	0.58	Q	V				18+30	0.4510	0.09	Q	
12+40	0.2572	0.60	Q	V				18+35	0.4516	0.09	Q	
12+45	0.2615	0.62	Q	V				18+40	0.4522	0.09	Q	
12+50	0.2658	0.63	Q	V				18+45	0.4527	0.08	Q	
12+55	0.2702	0.64	Q	V				18+50	0.4532	0.07	Q	
13+ 0	0.2747	0.65	Q	V				18+55	0.4537	0.07	Q	
13+ 5	0.2793	0.67	Q	V				19+ 0	0.4541	0.06	Q	
13+10	0.2841	0.70	Q	V				19+ 5	0.4545	0.06	Q	
13+15	0.2892	0.74	Q	V				19+10	0.4549	0.06	Q	
13+20	0.2944	0.75	Q	V				19+15	0.4553	0.07	Q	
13+25	0.2997	0.76	Q	V				19+20	0.4558	0.07	Q	
13+30	0.3050	0.77	Q	V				19+25	0.4563	0.08	Q	
13+35	0.3102	0.76	Q	V				19+30	0.4569	0.08	Q	
13+40	0.3150	0.69	Q	V				19+35	0.4575	0.08	Q	
13+45	0.3193	0.62	Q	V				19+40	0.4580	0.08	Q	
13+50	0.3233	0.59	Q	V				19+45	0.4586	0.07	Q	
13+55	0.3273	0.58	Q	V				19+50	0.4590	0.07	Q	
14+ 0	0.3312	0.57	Q	V				19+55	0.4595	0.06	Q	
14+ 5	0.3351	0.56	Q	V				20+ 0	0.4599	0.06	Q	
14+10	0.3391	0.58	Q	V				20+ 5	0.4603	0.05	Q	
14+15	0.3433	0.61	Q	V				20+10	0.4607	0.06	Q	
14+20	0.3475	0.61	Q	V				20+15	0.4611	0.06	Q	
14+25	0.3517	0.61	Q	V				20+20	0.4616	0.07	Q	
14+30	0.3559	0.61	Q	V				20+25	0.4620	0.07	Q	
14+35	0.3600	0.60	Q	V				20+30	0.4625	0.07	Q	
14+40	0.3642	0.60	Q	V				20+35	0.4630	0.07	Q	
14+45	0.3683	0.60	Q	V				20+40	0.4634	0.07	Q	
14+50	0.3725	0.60	Q	V				20+45	0.4639	0.07	Q	
14+55	0.3765	0.59	Q	V				20+50	0.4644	0.07	Q	
15+ 0	0.3806	0.59	Q	V				20+55	0.4648	0.06	Q	
15+ 5	0.3846	0.58	Q	V				21+ 0	0.4652	0.05	Q	
15+10	0.3886	0.58	Q	V				21+ 5	0.4656	0.05	Q	
15+15	0.3925	0.57	Q	V				21+10	0.4660	0.06	Q	
15+20	0.3964	0.56	Q	V				21+15	0.4664	0.06	Q	
15+25	0.4002	0.56	Q	V				21+20	0.4668	0.06	Q	
15+30	0.4040	0.55	Q	V				21+25	0.4672	0.06	Q	
15+35	0.4077	0.54	Q	V				21+30	0.4676	0.05	Q	
15+40	0.4112	0.51	Q	V				21+35	0.4680	0.05	Q	
15+45	0.4145	0.48	Q	V				21+40	0.4684	0.06	Q	
15+50	0.4177	0.47	Q	V				21+45	0.4688	0.06	Q	
15+55	0.4209	0.46	Q	V				21+50	0.4692	0.06	Q	
16+ 0	0.4240	0.46	Q	V				21+55	0.4697	0.06	Q	
16+ 5	0.4270	0.43	Q	V				22+ 0	0.4700	0.05	Q	
16+10	0.4293	0.33	Q	V				22+ 5	0.4704	0.05	Q	
16+15	0.4309	0.23	Q	V				22+10	0.4708	0.06	Q	
16+20	0.4321	0.19	Q	V				22+15	0.4712	0.06	Q	
16+25	0.4332	0.16	Q	V				22+20	0.4716	0.06	Q	
16+30	0.4342	0.14	Q	V				22+25	0.4720	0.06	Q	
16+35	0.4351	0.13	Q	V				22+30	0.4724	0.05	Q	
16+40	0.4359	0.11	Q	V				22+35	0.4728	0.05	Q	
16+45	0.4366	0.10	Q	V				22+40	0.4731	0.05	Q	
16+50	0.4372	0.09	Q	V				22+45	0.4734	0.05	Q	
16+55	0.4378	0.09	Q	V				22+50	0.4738	0.05	Q	
17+ 0	0.4384	0.08	Q	V				22+55	0.4741	0.05	Q	
17+ 5	0.4389	0.08	Q	V				23+ 0	0.4744	0.05	Q	
17+10	0.4395	0.09	Q	V				23+ 5	0.4747	0.05	Q	
17+15	0.4402	0.10	Q	V				23+10	0.4751	0.05	Q	
17+20	0.4410	0.11	Q	V				23+15	0.4754	0.05	Q	
17+25	0.4417	0.11	Q	V				23+20	0.4757	0.05	Q	
17+30	0.4425	0.11	Q	V				23+25	0.4760	0.05	Q	
17+35	0.4432	0.11	Q	V				23+30	0.4764	0.05	Q	
17+40	0.4440	0.11	Q	V				23+35	0.4767	0.05	Q	
17+45	0.4448	0.11	Q	V				23+40	0.4770	0.05	Q	
17+50	0.4456	0.11	Q	V				23+45	0.4773	0.05	Q	

23+50	0.4776	0.05	Q	|	|	|	V|
23+55	0.4780	0.05	Q	|	|	|	V|
24+ 0	0.4783	0.05	Q	|	|	|	V|
24+ 5	0.4786	0.04	Q	|	|	|	V|
24+10	0.4788	0.03	Q	|	|	|	V|
24+15	0.4789	0.02	Q	|	|	|	V|
24+20	0.4790	0.01	Q	|	|	|	V|
24+25	0.4790	0.01	Q	|	|	|	V|
24+30	0.4791	0.01	Q	|	|	|	V|
24+35	0.4791	0.00	Q	|	|	|	V|
24+40	0.4791	0.00	Q	|	|	|	V|
24+45	0.4792	0.00	Q	|	|	|	V|
24+50	0.4792	0.00	Q	|	|	|	V|
24+55	0.4792	0.00	Q	|	|	|	V|
25+ 0	0.4792	0.00	Q	|	|	|	V|
25+ 5	0.4792	0.00	Q	|	|	|	V|
25+10	0.4792	0.00	Q	|	|	|	V|
25+15	0.4792	0.00	Q	|	|	|	V|

APPENDIX C.3: 10-YEAR STORM EVENT

1-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPRE110.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used
English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
EXISTING CONDITION
FN: ARAPRE

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(Ft.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.163 Hr.
Lag time = 9.75 Min.
25% of lag time = 2.44 Min.
40% of lag time = 3.90 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 0.45 5.17

100 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 1.20 13.80

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 0.450(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 0.759(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 0.758(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 71.00 0.161
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
71.0	71.0	0.350	0.161	0.299	1.000	0.299
						Sum (F) = 0.299

Area averaged mean soil loss (F) (In/Hr) = 0.299
Minimum soil loss rate ((In/Hr)) = 0.150
(for 24 hour storm duration)

Soil loss rate (decimal) = 0.771

Slope of intensity-duration curve for a 1 hour storm = 0.5000

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph Graph (CFS)
------------------------	---------------	----------------------	-----------------------------

1	0.083	51.266	6.366	0.738
2	0.167	102.533	27.222	3.155
3	0.250	153.799	28.703	3.327
4	0.333	205.065	12.516	1.451
5	0.417	256.331	6.680	0.774
6	0.500	307.598	4.653	0.539
7	0.583	358.864	3.341	0.387
8	0.667	410.130	2.524	0.293
9	0.750	461.397	1.836	0.213
10	0.833	512.663	1.556	0.180
11	0.917	563.929	1.237	0.143
12	1.000	615.195	0.968	0.112
13	1.083	666.462	0.758	0.088
14	1.167	717.728	0.560	0.065
15	1.250	768.994	0.513	0.059
16	1.333	820.260	0.566	0.066
			Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit (Hr.)	Time Percent	Storm Rain (In/Hr)	Loss rate(0.299)	Effective (In/Hr)
			Max | Low	
1	0.08	4.20	0.382 (0.299)	0.087
2	0.17	4.30	0.391 (0.299)	0.092
3	0.25	5.00	0.455 (0.299)	0.156
4	0.33	5.00	0.455 (0.351)	0.156
5	0.42	5.80	0.528 (0.299)	0.228
6	0.50	6.50	0.592 (0.299)	0.292
7	0.58	7.40	0.674 (0.299)	0.374
8	0.67	8.60	0.783 (0.299)	0.483
9	0.75	12.30	1.120 (0.299)	0.820
10	0.83	29.10	2.649 (0.299)	2.349
11	0.92	6.80	0.619 (0.299)	0.319
12	1.00	5.00	0.455 (0.351)	0.156
			(Loss Rate Not Used)	

Sum = 100.0 Sum = 5.5

Flood volume = Effective rainfall 0.46(In) times area 11.5(Ac.)/(In)/(Ft.) = 0.4(Ac.Ft)

Total soil loss = 0.30(In)

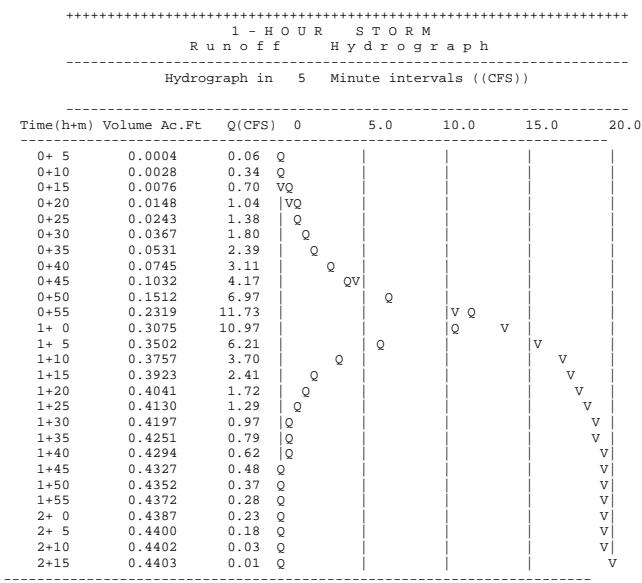
Total rainfall = 0.287(Ac.Ft)

Total rainfall = 0.76(In)

Flood volume = 19178.0 Cubic Feet

Total soil loss = 12484.6 Cubic Feet

Peak flow rate of this hydrograph = 11.726(CFS)



3-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPRE310.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16

UNIT HYDROGRAPH FOR AREA A

EXISTING CONDITION

FN: ARAPRE

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.

Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.

Length along longest watercourse = 3338.00(Ft.)

Length along longest watercourse measured to centroid = 1232.00(Ft.)

Length along longest watercourse = 0.632 Mi.

Length along longest watercourse measured to centroid = 0.233 Mi.

Difference in elevation = 34.70(Ft.)

Slope along watercourse = 54.8880 Ft./Mi.

Average Manning's 'N' = 0.030

Lag time = 0.163 Hr.

Lag time = 9.75 Min.

25% of lag time = 2.44 Min.

40% of lag time = 3.90 Min.

Unit time = 5.00 Min.

Duration of storm = 3 Hour(s)

User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	0.80	9.20

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.80	20.70

STORM EVENT (YEAR) = 10.00

Area Averaged 2-Year Rainfall = 0.800(In)

Area Averaged 100-Year Rainfall = 1.800(In)

Point rain (area averaged) = 1.211(In)

Areal adjustment factor = 99.99 %

Adjusted average point rain = 1.211(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.500	71.00	0.161

Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
71.0	71.0	0.350	0.161	0.299	1.000	0.299
					Sum (F)	0.299

Area averaged mean soil loss (F) (In/Hr) = 0.299

Minimum soil loss rate ((In/Hr)) = 0.150

(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.771

Unit Hydrograph VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	51.266	6.366
2	0.167	102.533	27.222
3	0.250	153.799	28.703
4	0.333	205.065	12.516
5	0.417	256.331	6.680
6	0.500	307.598	4.653
7	0.583	358.864	3.341
8	0.667	410.130	2.524
9	0.750	461.397	1.836
10	0.833	512.663	1.556
11	0.917	563.929	1.237
12	1.000	615.195	0.968
13	1.083	666.462	0.758
14	1.167	717.728	0.560
15	1.250	768.994	0.513
16	1.333	820.260	0.566
		Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective
(Hr.)	Percent	(In/Hr)	Max | Low	(In/Hr)	
1	0.08	1.30	0.189	(0.299)	0.146
2	0.17	1.30	0.189	(0.299)	0.146
3	0.25	1.10	0.160	(0.299)	0.123
4	0.33	1.50	0.218	(0.299)	0.168
5	0.42	1.50	0.218	(0.299)	0.168
6	0.50	1.80	0.262	(0.299)	0.202
7	0.58	1.50	0.218	(0.299)	0.168
8	0.67	1.80	0.262	(0.299)	0.202
9	0.75	1.80	0.262	(0.299)	0.202
10	0.83	1.50	0.218	(0.299)	0.168
11	0.92	1.60	0.233	(0.299)	0.179
12	1.00	1.80	0.262	(0.299)	0.202
13	1.08	2.20	0.320	(0.299)	0.247
14	1.17	2.20	0.320	(0.299)	0.247
15	1.25	2.20	0.320	(0.299)	0.247
16	1.33	2.00	0.291	(0.299)	0.224
17	1.42	2.60	0.378	(0.299)	0.291
18	1.50	2.70	0.392	0.299 (0.303)	0.093
19	1.58	2.40	0.349	(0.299)	0.269
20	1.67	2.70	0.392	0.299 (0.303)	0.093
21	1.75	3.30	0.480	0.299 (0.370)	0.180
22	1.83	3.10	0.451	0.299 (0.348)	0.151
23	1.92	2.90	0.422	0.299 (0.325)	0.122
24	2.00	3.00	0.436	0.299 (0.336)	0.137
25	2.08	3.10	0.451	0.299 (0.348)	0.151
26	2.17	4.20	0.611	0.299 (0.471)	0.311

27	2.25	5.00	0.727	0.299	(0.561)	0.427	3+25	0.4746	0.50	|Q	|	|	|	V|
28	2.33	3.50	0.509	0.299	(0.392)	0.209	3+30	0.4772	0.38	|Q	|	|	|	V|
29	2.42	6.80	0.988	0.299	(0.762)	0.689	3+35	0.4792	0.28	|Q	|	|	|	V|
30	2.50	7.30	1.061	0.299	(0.818)	0.762	3+40	0.4807	0.23	Q	|	|	|	V|
31	2.58	8.20	1.192	0.299	(0.919)	0.893	3+45	0.4819	0.16	Q	|	|	|	V|
32	2.67	5.90	0.858	0.299	(0.661)	0.558	3+50	0.4826	0.11	Q	|	|	|	V|
33	2.75	2.00	0.291	(0.299)	0.224	0.067	3+55	0.4830	0.05	Q	|	|	|	V|
34	2.83	1.80	0.262	(0.299)	0.202	0.060	4+ 0	0.4831	0.01	Q	|	|	|	V|
35	2.92	1.80	0.262	(0.299)	0.202	0.060	4+ 5	0.4831	0.01	Q	|	|	|	V|
36	3.00	0.60	0.087	(0.299)	0.067	0.020	4+10	0.4832	0.01	Q	|	|	|	V|
(Loss Rate Not Used)														
Sum =	100.0						4+15	0.4832	0.00	Q	|	|	|	V

Flood volume = Effective rainfall 0.50(In)
times area 11.5(Ac.)/[(In)/(Ft.)] = 0.5(Ac.Ft)
Total soil loss = 0.71(In)
Total soil loss = 0.678(Ac.Ft)
Total rainfall = 1.21(In)
Flood volume = 21047.3 Cubic Feet
Total soil loss = 29520.4 Cubic Feet

Peak flow rate of this hydrograph = 7.440(CFS)

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3 - H O U R S T O R M
Run off Hydrograph

Hydrograph in 5 Minute intervals ((CFS))

Time(h:m)	Volume	Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0002	0.03	Q					
0+10	0.0014	0.17	Q					
0+15	0.0035	0.31	VQ					
0+20	0.0060	0.36	VQ					
0+25	0.0088	0.41	VQ					
0+30	0.0121	0.48	|Q					
0+35	0.0158	0.53	|VQ					
0+40	0.0196	0.56	|VQ					
0+45	0.0237	0.59	|VQ					
0+50	0.0279	0.62	| Q					
0+55	0.0321	0.61	| O					
1+ 0	0.0363	0.60	| QV					
1+ 5	0.0407	0.64	| QV					
1+10	0.0456	0.71	| QV					
1+15	0.0509	0.77	| QV					
1+20	0.0563	0.79	| QV					
1+25	0.0618	0.80	| Q V					
1+30	0.0677	0.85	| Q V					
1+35	0.0741	0.93	| Q V					
1+40	0.0806	0.95	| Q V					
1+45	0.0878	1.04	| Q V					
1+50	0.0969	1.33	| Q V					
1+55	0.1074	1.53	| Q V					
2+ 0	0.1177	1.49	| Q V					
2+ 5	0.1279	1.48	| Q V					
2+10	0.1395	1.68	| Q |V					
2+15	0.1557	2.35	| Q |V					
2+20	0.1771	3.12	| Q V					
2+25	0.2007	3.42	| Q V					
2+30	0.2322	4.57	| QV					
2+35	0.2761	6.37	| V Q					
2+40	0.3273	7.44	| V Q					
2+45	0.3749	6.91	| Q |V					
2+50	0.4076	4.74	| Q |V					
2+55	0.4277	2.92	| Q |V					
3+ 0	0.4424	2.13	| Q |V					
3+ 5	0.4533	1.59	| Q |V					
3+10	0.4611	1.13	| Q |V					
3+15	0.4668	0.82	Q V					
3+20	0.4711	0.63	Q V					

6-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPRE610.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16

UNIT HYDROGRAPH FOR AREA A
EXISTING CONDITION

FN: ARAPRE

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(Ft.)
Slope along watercourse = 54.8880 Ft./Mi.

Average Manning's 'N' = 0.030

Lag time = 0.163 Hr.

Lag time = 9.75 Min.

25% of lag time = 2.44 Min.

40% of lag time = 3.90 Min.

Unit time = 5.00 Min.

Duration of storm = 6 Hour(s)

User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.00	11.50

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	2.50	28.75

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 1.000(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 1.617(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.617(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.500	71.00	0.161
Total Area Entered	=	11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
71.0	71.0	0.350	0.161	0.299	1.000	0.299
					Sum (F)	0.299

Area averaged mean soil loss (F) (In/Hr) = 0.299

Minimum soil loss rate ((In/Hr)) = 0.150

(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.771

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	51.266	6.366	0.738
2	0.167	102.533	27.222	3.155
3	0.250	153.799	28.703	3.327
4	0.333	205.065	12.516	1.451
5	0.417	256.331	6.680	0.774
6	0.500	307.598	4.653	0.539
7	0.583	358.864	3.341	0.387
8	0.667	410.130	2.524	0.293
9	0.750	461.397	1.836	0.213
10	0.833	512.663	1.556	0.180
11	0.917	563.929	1.237	0.143
12	1.000	615.195	0.968	0.112
13	1.083	666.462	0.758	0.088
14	1.167	717.728	0.560	0.065
15	1.250	768.994	0.513	0.059
16	1.333	820.260	0.566	0.066
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective
(Hr.)	Percent	(In/Hr)	Max | Low	(In/Hr)	
1	0.08	0.50	0.097	(0.299)	0.075
2	0.17	0.60	0.116	(0.299)	0.090
3	0.25	0.60	0.116	(0.299)	0.090
4	0.33	0.60	0.116	(0.299)	0.090
5	0.42	0.60	0.116	(0.299)	0.090
6	0.50	0.70	0.136	(0.299)	0.105
7	0.58	0.70	0.136	(0.299)	0.105
8	0.67	0.70	0.136	(0.299)	0.105
9	0.75	0.70	0.136	(0.299)	0.105
10	0.83	0.70	0.136	(0.299)	0.105
11	0.92	0.70	0.136	(0.299)	0.105
12	1.00	0.80	0.155	(0.299)	0.120
13	1.08	0.80	0.155	(0.299)	0.120
14	1.17	0.80	0.155	(0.299)	0.120
15	1.25	0.80	0.155	(0.299)	0.120
16	1.33	0.80	0.155	(0.299)	0.120
17	1.42	0.80	0.155	(0.299)	0.120
18	1.50	0.80	0.155	(0.299)	0.120
19	1.58	0.80	0.155	(0.299)	0.120
20	1.67	0.80	0.155	(0.299)	0.120
21	1.75	0.80	0.155	(0.299)	0.120
22	1.83	0.80	0.155	(0.299)	0.120
23	1.92	0.80	0.155	(0.299)	0.120
24	2.00	0.90	0.175	(0.299)	0.135
25	2.08	0.80	0.155	(0.299)	0.120
26	2.17	0.90	0.175	(0.299)	0.135

6+20	0.5363	0.35	|Q	|	|	|	V|
6+25	0.5382	0.27	|Q	|	|	|	V|
6+30	0.5396	0.20	Q	|	|	|	V|
6+35	0.5406	0.15	Q	|	|	|	V|
6+40	0.5413	0.11	Q	|	|	|	V|
6+45	0.5418	0.07	Q	|	|	|	V|
6+50	0.5419	0.01	Q	|	|	|	V|
6+55	0.5420	0.01	Q	|	|	|	V|
7+ 0	0.5420	0.00	Q	|	|	|	V|
7+ 5	0.5420	0.00	Q	|	|	|	V|
7+10	0.5420	0.00	Q				V
7+15	0.5420	0.00	Q				V

24-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPRE2410.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
EXISTING CONDITION
FN: ARAPRE

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.

Difference in elevation = 34.70(Ft.)

Slope along watercourse = 54.8880 Ft./Mi.

Average Manning's 'N' = 0.030

Lag time = 0.163 Hr.

Lag time = 9.75 Min.

25% of lag time = 2.44 Min.

40% of lag time = 3.90 Min.

Unit time = 5.00 Min.

Duration of storm = 24 Hour(s)

User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 1.60 18.40

100 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 4.10 47.15

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.100(In)

Point rain (area averaged) = 2.629(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.628(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 71.00 0.161
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
71.0	71.0	0.350	0.161	0.299	1.000	0.299
					Sum (F)	0.299

Area averaged mean soil loss (F) (In/Hr) = 0.299

Minimum soil loss rate ((In/Hr)) = 0.150

(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.771

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	51.266	6.366	0.738
2	0.167	102.533	27.222	3.155
3	0.250	153.799	28.703	3.327
4	0.333	205.065	12.516	1.451
5	0.417	256.331	6.680	0.774
6	0.500	307.598	4.653	0.539
7	0.583	358.864	3.341	0.387
8	0.667	410.130	2.524	0.293
9	0.750	461.397	1.836	0.213
10	0.833	512.663	1.556	0.180
11	0.917	563.929	1.237	0.143
12	1.000	615.195	0.968	0.112
13	1.083	666.462	0.758	0.088
14	1.167	717.728	0.560	0.065
15	1.250	768.994	0.513	0.059
16	1.333	820.260	0.566	0.066
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective
(Hr.)	Percent	(In/Hr)	Max | Low	(In/Hr)	
1	0.08	0.07	0.021 | ( 0.531)	0.016	0.005
2	0.17	0.07	0.021 | ( 0.529)	0.016	0.005
3	0.25	0.07	0.021 | ( 0.527)	0.016	0.005
4	0.33	0.10	0.032 | ( 0.525)	0.024	0.007
5	0.42	0.10	0.032 | ( 0.523)	0.024	0.007
6	0.50	0.10	0.032 | ( 0.521)	0.024	0.007
7	0.58	0.10	0.032 | ( 0.519)	0.024	0.007
8	0.67	0.10	0.032 | ( 0.517)	0.024	0.007
9	0.75	0.10	0.032 | ( 0.515)	0.024	0.007
10	0.83	0.13	0.042 | ( 0.513)	0.032	0.010
11	0.92	0.13	0.042 | ( 0.511)	0.032	0.010
12	1.00	0.13	0.042 | ( 0.508)	0.032	0.010
13	1.08	0.10	0.032 | ( 0.506)	0.024	0.007
14	1.17	0.10	0.032 | ( 0.504)	0.024	0.007
15	1.25	0.10	0.032 | ( 0.502)	0.024	0.007
16	1.33	0.10	0.032 | ( 0.500)	0.024	0.007
17	1.42	0.10	0.032 | ( 0.498)	0.024	0.007
18	1.50	0.10	0.032 | ( 0.496)	0.024	0.007
19	1.58	0.10	0.032 | ( 0.495)	0.024	0.007
20	1.67	0.10	0.032 | ( 0.493)	0.024	0.007
21	1.75	0.10	0.032 | ( 0.491)	0.024	0.007
22	1.83	0.13	0.042 | ( 0.489)	0.032	0.010
23	1.92	0.13	0.042 | ( 0.487)	0.032	0.010
24	2.00	0.13	0.042 | ( 0.485)	0.032	0.010
25	2.08	0.13	0.042 | ( 0.483)	0.032	0.010
26	2.17	0.13	0.042 | ( 0.481)	0.032	0.010

27	2.25	0.13	0.042	(0.479)	0.032	0.010	98	8.17	0.50	0.158	(0.351)	0.122	0.036
28	2.33	0.13	0.042	(0.477)	0.032	0.010	99	8.25	0.50	0.158	(0.349)	0.122	0.036
29	2.42	0.13	0.042	(0.475)	0.032	0.010	100	8.33	0.50	0.158	(0.348)	0.122	0.036
30	2.50	0.13	0.042	(0.473)	0.032	0.010	101	8.42	0.50	0.158	(0.346)	0.122	0.036
31	2.58	0.17	0.053	(0.471)	0.041	0.012	102	8.50	0.50	0.158	(0.345)	0.122	0.036
32	2.67	0.17	0.053	(0.469)	0.041	0.012	103	8.58	0.53	0.168	(0.343)	0.130	0.038
33	2.75	0.17	0.053	(0.467)	0.041	0.012	104	8.67	0.53	0.168	(0.341)	0.130	0.038
34	2.83	0.17	0.053	(0.465)	0.041	0.012	105	8.75	0.53	0.168	(0.340)	0.130	0.038
35	2.92	0.17	0.053	(0.463)	0.041	0.012	106	8.83	0.57	0.179	(0.338)	0.138	0.041
36	3.00	0.17	0.053	(0.461)	0.041	0.012	107	8.92	0.57	0.179	(0.337)	0.138	0.041
37	3.08	0.17	0.053	(0.459)	0.041	0.012	108	9.00	0.57	0.179	(0.335)	0.138	0.041
38	3.17	0.17	0.053	(0.458)	0.041	0.012	109	9.08	0.63	0.200	(0.333)	0.154	0.046
39	3.25	0.17	0.053	(0.456)	0.041	0.012	110	9.17	0.63	0.200	(0.332)	0.154	0.046
40	3.33	0.17	0.053	(0.454)	0.041	0.012	111	9.25	0.63	0.200	(0.330)	0.154	0.046
41	3.42	0.17	0.053	(0.452)	0.041	0.012	112	9.33	0.67	0.210	(0.329)	0.162	0.048
42	3.50	0.17	0.053	(0.450)	0.041	0.012	113	9.42	0.67	0.210	(0.327)	0.162	0.048
43	3.58	0.17	0.053	(0.448)	0.041	0.012	114	9.50	0.67	0.210	(0.326)	0.162	0.048
44	3.67	0.17	0.053	(0.446)	0.041	0.012	115	9.58	0.70	0.221	(0.324)	0.170	0.051
45	3.75	0.17	0.053	(0.444)	0.041	0.012	116	9.67	0.70	0.221	(0.322)	0.170	0.051
46	3.83	0.20	0.063	(0.442)	0.049	0.014	117	9.75	0.70	0.221	(0.321)	0.170	0.051
47	3.92	0.20	0.063	(0.441)	0.049	0.014	118	9.83	0.73	0.231	(0.319)	0.178	0.053
48	4.00	0.20	0.063	(0.439)	0.049	0.014	119	9.92	0.73	0.231	(0.318)	0.178	0.053
49	4.08	0.20	0.063	(0.437)	0.049	0.014	120	10.00	0.73	0.231	(0.316)	0.178	0.053
50	4.17	0.20	0.063	(0.435)	0.049	0.014	121	10.08	0.50	0.158	(0.315)	0.122	0.036
51	4.25	0.20	0.063	(0.433)	0.049	0.014	122	10.17	0.50	0.158	(0.313)	0.122	0.036
52	4.33	0.23	0.074	(0.431)	0.057	0.017	123	10.25	0.50	0.158	(0.312)	0.122	0.036
53	4.42	0.23	0.074	(0.429)	0.057	0.017	124	10.33	0.50	0.158	(0.310)	0.122	0.036
54	4.50	0.23	0.074	(0.428)	0.057	0.017	125	10.42	0.50	0.158	(0.309)	0.122	0.036
55	4.58	0.23	0.074	(0.426)	0.057	0.017	126	10.50	0.50	0.158	(0.307)	0.122	0.036
56	4.67	0.23	0.074	(0.424)	0.057	0.017	127	10.58	0.67	0.210	(0.306)	0.162	0.048
57	4.75	0.23	0.074	(0.422)	0.057	0.017	128	10.67	0.67	0.210	(0.304)	0.162	0.048
58	4.83	0.27	0.084	(0.420)	0.065	0.019	129	10.75	0.67	0.210	(0.303)	0.162	0.048
59	4.92	0.27	0.084	(0.419)	0.065	0.019	130	10.83	0.67	0.210	(0.301)	0.162	0.048
60	5.00	0.27	0.084	(0.417)	0.065	0.019	131	10.92	0.67	0.210	(0.300)	0.162	0.048
61	5.08	0.20	0.063	(0.415)	0.049	0.014	132	11.00	0.67	0.210	(0.298)	0.162	0.048
62	5.17	0.20	0.063	(0.413)	0.049	0.014	133	11.08	0.63	0.200	(0.297)	0.154	0.046
63	5.25	0.20	0.063	(0.411)	0.049	0.014	134	11.17	0.63	0.200	(0.295)	0.154	0.046
64	5.33	0.23	0.074	(0.409)	0.057	0.017	135	11.25	0.63	0.200	(0.294)	0.154	0.046
65	5.42	0.23	0.074	(0.408)	0.057	0.017	136	11.33	0.63	0.200	(0.292)	0.154	0.046
66	5.50	0.23	0.074	(0.406)	0.057	0.017	137	11.42	0.63	0.200	(0.291)	0.154	0.046
67	5.58	0.27	0.084	(0.404)	0.065	0.019	138	11.50	0.63	0.200	(0.289)	0.154	0.046
68	5.67	0.27	0.084	(0.402)	0.065	0.019	139	11.58	0.57	0.179	(0.288)	0.138	0.041
69	5.75	0.27	0.084	(0.401)	0.065	0.019	140	11.67	0.57	0.179	(0.287)	0.138	0.041
70	5.83	0.27	0.084	(0.399)	0.065	0.019	141	11.75	0.57	0.179	(0.285)	0.138	0.041
71	5.92	0.27	0.084	(0.397)	0.065	0.019	142	11.83	0.60	0.189	(0.284)	0.146	0.043
72	6.00	0.27	0.084	(0.395)	0.065	0.019	143	11.92	0.60	0.189	(0.282)	0.146	0.043
73	6.08	0.30	0.095	(0.394)	0.073	0.022	144	12.00	0.60	0.189	(0.281)	0.146	0.043
74	6.17	0.30	0.095	(0.392)	0.073	0.022	145	12.08	0.83	0.263	(0.280)	0.203	0.060
75	6.25	0.30	0.095	(0.390)	0.073	0.022	146	12.17	0.83	0.263	(0.278)	0.203	0.060
76	6.33	0.30	0.095	(0.388)	0.073	0.022	147	12.25	0.83	0.263	(0.277)	0.203	0.060
77	6.42	0.30	0.095	(0.387)	0.073	0.022	148	12.33	0.87	0.273	(0.275)	0.211	0.063
78	6.50	0.30	0.095	(0.385)	0.073	0.022	149	12.42	0.87	0.273	(0.274)	0.211	0.063
79	6.58	0.33	0.105	(0.383)	0.081	0.024	150	12.50	0.87	0.273	(0.273)	0.211	0.063
80	6.67	0.33	0.105	(0.381)	0.081	0.024	151	12.58	0.93	0.294	(0.271)	0.227	0.067
81	6.75	0.33	0.105	(0.380)	0.081	0.024	152	12.67	0.93	0.294	(0.270)	0.227	0.067
82	6.83	0.33	0.105	(0.378)	0.081	0.024	153	12.75	0.93	0.294	(0.268)	0.227	0.067
83	6.92	0.33	0.105	(0.376)	0.081	0.024	154	12.83	0.97	0.305	(0.267)	0.235	0.070
84	7.00	0.33	0.105	(0.375)	0.081	0.024	155	12.92	0.97	0.305	(0.266)	0.235	0.070
85	7.08	0.33	0.105	(0.373)	0.081	0.024	156	13.00	0.97	0.305	(0.264)	0.235	0.070
86	7.17	0.33	0.105	(0.371)	0.081	0.024	157	13.08	1.13	0.357	0.263	(0.276)	0.094
87	7.25	0.33	0.105	(0.369)	0.081	0.024	158	13.17	1.13	0.357	0.262	(0.276)	0.096
88	7.33	0.37	0.116	(0.368)	0.089	0.026	159	13.25	1.13	0.357	0.260	(0.276)	0.097
89	7.42	0.37	0.116	(0.366)	0.089	0.026	160	13.33	1.13	0.357	0.259	(0.276)	0.098
90	7.50	0.37	0.116	(0.364)	0.089	0.026	161	13.42	1.13	0.357	0.258	(0.276)	0.100
91	7.58	0.40	0.126	(0.363)	0.097	0.029	162	13.50	1.13	0.357	0.256	(0.276)	0.101
92	7.67	0.40	0.126	(0.361)	0.097	0.029	163	13.58	0.77	0.242	(0.255)	0.186	0.055
93	7.75	0.40	0.126	(0.359)	0.097	0.029	164	13.67	0.77	0.242	(0.254)	0.186	0.055
94	7.83	0.43	0.137	(0.358)	0.105	0.031	165	13.75	0.77	0.242	(0.253)	0.186	0.055
95	7.92	0.43	0.137	(0.356)	0.105	0.031	166	13.83	0.77	0.242	(0.251)	0.186	0.055
96	8.00	0.43	0.137	(0.354)	0.105	0.031	167	13.92	0.77	0.242	(0.250)	0.186	0.055
97	8.08	0.50	0.158	(0.353)	0.122	0.036	168	14.00	0.77	0.242	(0.249)	0.186	0.055

169	14.08	0.90	0.284	(0.247)	0.219	0.065		240	20.00	0.07	0.021	(0.174)	0.016	0.005
170	14.17	0.90	0.284	(0.246)	0.219	0.065		241	20.08	0.10	0.032	(0.173)	0.024	0.007
171	14.25	0.90	0.284	(0.245)	0.219	0.065		242	20.17	0.10	0.032	(0.172)	0.024	0.007
172	14.33	0.87	0.273	(0.244)	0.211	0.063		243	20.25	0.10	0.032	(0.172)	0.024	0.007
173	14.42	0.87	0.273	(0.242)	0.211	0.063		244	20.33	0.10	0.032	(0.171)	0.024	0.007
174	14.50	0.87	0.273	(0.241)	0.211	0.063		245	20.42	0.10	0.032	(0.170)	0.024	0.007
175	14.58	0.87	0.273	(0.240)	0.211	0.063		246	20.50	0.10	0.032	(0.169)	0.024	0.007
176	14.67	0.87	0.273	(0.239)	0.211	0.063		247	20.58	0.10	0.032	(0.169)	0.024	0.007
177	14.75	0.87	0.273	(0.238)	0.211	0.063		248	20.67	0.10	0.032	(0.168)	0.024	0.007
178	14.83	0.83	0.263	(0.236)	0.203	0.060		249	20.75	0.10	0.032	(0.167)	0.024	0.007
179	14.92	0.83	0.263	(0.235)	0.203	0.060		250	20.83	0.07	0.021	(0.167)	0.016	0.005
180	15.00	0.83	0.263	(0.234)	0.203	0.060		251	20.92	0.07	0.021	(0.166)	0.016	0.005
181	15.08	0.80	0.252	(0.233)	0.195	0.058		252	21.00	0.07	0.021	(0.165)	0.016	0.005
182	15.17	0.80	0.252	(0.231)	0.195	0.058		253	21.08	0.10	0.032	(0.165)	0.024	0.007
183	15.25	0.80	0.252	(0.230)	0.195	0.058		254	21.17	0.10	0.032	(0.164)	0.024	0.007
184	15.33	0.77	0.242	(0.229)	0.186	0.055		255	21.25	0.10	0.032	(0.163)	0.024	0.007
185	15.42	0.77	0.242	(0.228)	0.186	0.055		256	21.33	0.07	0.021	(0.163)	0.016	0.005
186	15.50	0.77	0.242	(0.227)	0.186	0.055		257	21.42	0.07	0.021	(0.162)	0.016	0.005
187	15.58	0.63	0.200	(0.226)	0.154	0.046		258	21.50	0.07	0.021	(0.161)	0.016	0.005
188	15.67	0.63	0.200	(0.224)	0.154	0.046		259	21.58	0.10	0.032	(0.161)	0.024	0.007
189	15.75	0.63	0.200	(0.223)	0.154	0.046		260	21.67	0.10	0.032	(0.160)	0.024	0.007
190	15.83	0.63	0.200	(0.222)	0.154	0.046		261	21.75	0.10	0.032	(0.160)	0.024	0.007
191	15.92	0.63	0.200	(0.221)	0.154	0.046		262	21.83	0.07	0.021	(0.159)	0.016	0.005
192	16.00	0.63	0.200	(0.220)	0.154	0.046		263	21.92	0.07	0.021	(0.159)	0.016	0.005
193	16.08	0.13	0.042	(0.219)	0.032	0.010		264	22.00	0.07	0.021	(0.158)	0.016	0.005
194	16.17	0.13	0.042	(0.218)	0.032	0.010		265	22.08	0.10	0.032	(0.158)	0.024	0.007
195	16.25	0.13	0.042	(0.217)	0.032	0.010		266	22.17	0.10	0.032	(0.157)	0.024	0.007
196	16.33	0.13	0.042	(0.215)	0.032	0.010		267	22.25	0.10	0.032	(0.157)	0.024	0.007
197	16.42	0.13	0.042	(0.214)	0.032	0.010		268	22.33	0.07	0.021	(0.156)	0.016	0.005
198	16.50	0.13	0.042	(0.213)	0.032	0.010		269	22.42	0.07	0.021	(0.156)	0.016	0.005
199	16.58	0.10	0.032	(0.212)	0.024	0.007		270	22.50	0.07	0.021	(0.155)	0.016	0.005
200	16.67	0.10	0.032	(0.211)	0.024	0.007		271	22.58	0.07	0.021	(0.155)	0.016	0.005
201	16.75	0.10	0.032	(0.210)	0.024	0.007		272	22.67	0.07	0.021	(0.154)	0.016	0.005
202	16.83	0.10	0.032	(0.209)	0.024	0.007		273	22.75	0.07	0.021	(0.154)	0.016	0.005
203	16.92	0.10	0.032	(0.208)	0.024	0.007		274	22.83	0.07	0.021	(0.153)	0.016	0.005
204	17.00	0.10	0.032	(0.207)	0.024	0.007		275	22.92	0.07	0.021	(0.153)	0.016	0.005
205	17.08	0.17	0.053	(0.206)	0.041	0.012		276	23.00	0.07	0.021	(0.153)	0.016	0.005
206	17.17	0.17	0.053	(0.205)	0.041	0.012		277	23.08	0.07	0.021	(0.152)	0.016	0.005
207	17.25	0.17	0.053	(0.204)	0.041	0.012		278	23.17	0.07	0.021	(0.152)	0.016	0.005
208	17.33	0.17	0.053	(0.203)	0.041	0.012		279	23.25	0.07	0.021	(0.152)	0.016	0.005
209	17.42	0.17	0.053	(0.202)	0.041	0.012		280	23.33	0.07	0.021	(0.151)	0.016	0.005
210	17.50	0.17	0.053	(0.201)	0.041	0.012		281	23.42	0.07	0.021	(0.151)	0.016	0.005
211	17.58	0.17	0.053	(0.200)	0.041	0.012		282	23.50	0.07	0.021	(0.151)	0.016	0.005
212	17.67	0.17	0.053	(0.199)	0.041	0.012		283	23.58	0.07	0.021	(0.151)	0.016	0.005
213	17.75	0.17	0.053	(0.198)	0.041	0.012		284	23.67	0.07	0.021	(0.150)	0.016	0.005
214	17.83	0.13	0.042	(0.197)	0.032	0.010		285	23.75	0.07	0.021	(0.150)	0.016	0.005
215	17.92	0.13	0.042	(0.196)	0.032	0.010		286	23.83	0.07	0.021	(0.150)	0.016	0.005
216	18.00	0.13	0.042	(0.195)	0.032	0.010		287	23.92	0.07	0.021	(0.150)	0.016	0.005
217	18.08	0.13	0.042	(0.194)	0.032	0.010		288	24.00	0.07	0.021	(0.150)	0.016	0.005
218	18.17	0.13	0.042	(0.193)	0.032	0.010								
219	18.25	0.13	0.042	(0.192)	0.032	0.010								
220	18.33	0.13	0.042	(0.191)	0.032	0.010								
221	18.42	0.13	0.042	(0.190)	0.032	0.010								
222	18.50	0.13	0.042	(0.189)	0.032	0.010								
223	18.58	0.10	0.032	(0.188)	0.024	0.007								
224	18.67	0.10	0.032	(0.187)	0.024	0.007								
225	18.75	0.10	0.032	(0.186)	0.024	0.007								
226	18.83	0.07	0.021	(0.186)	0.016	0.005								
227	18.92	0.07	0.021	(0.185)	0.016	0.005								
228	19.00	0.07	0.021	(0.184)	0.016	0.005								
229	19.08	0.10	0.032	(0.183)	0.024	0.007								
230	19.17	0.10	0.032	(0.182)	0.024	0.007								
231	19.25	0.10	0.032	(0.181)	0.024	0.007								
232	19.33	0.13	0.042	(0.180)	0.032	0.010								
233	19.42	0.13	0.042	(0.180)	0.032	0.010								
234	19.50	0.13	0.042	(0.179)	0.032	0.010								
235	19.58	0.10	0.032	(0.178)	0.024	0.007								
236	19.67	0.10	0.032	(0.177)	0.024	0.007								
237	19.75	0.10	0.032	(0.176)	0.024	0.007								
238	19.83	0.07	0.021	(0.175)	0.016	0.005								
239	19.92	0.07	0.021	(0.175)	0.016	0.005								

(Loss Rate Not Used)

Sum = 100.0 Sum = 7.3

Flood volume = Effective rainfall 0.61(In)
times area 11.5(Ac.)/(In)/(Ft.)] = 0.6(Ac.Ft)

Total soil loss = 2.02(In)
Total soil loss = 1.935(Ac.Ft)
Total rainfall = 2.63(In)
Flood volume = 25436.9 Cubic Feet
Total soil loss = 84288.2 Cubic Feet

Peak flow rate of this hydrograph = 1.091(CFS)

+++++
24 - H O U R S T O R M
Runoff Hydrograph

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m) Volume Ac.Ft Q(CFS) 0 2.5 5.0 7.5 10.0

0+ 5 0.0000 0.00 Q | | | | |

0+10	0.0002	0.02	Q
0+15	0.0004	0.03	Q
0+20	0.0007	0.04	Q
0+25	0.0011	0.05	Q
0+30	0.0015	0.07	Q
0+35	0.0020	0.07	Q
0+40	0.0025	0.07	Q
0+45	0.0030	0.08	Q
0+50	0.0036	0.08	Q
0+55	0.0042	0.09	Q
1+ 0	0.0049	0.10	Q
1+ 5	0.0056	0.10	Q
1+10	0.0062	0.10	Q
1+15	0.0068	0.09	Q
1+20	0.0074	0.09	Q
1+25	0.0080	0.09	Q
1+30	0.0086	0.09	Q
1+35	0.0092	0.09	Q
1+40	0.0098	0.08	Q
1+45	0.0104	0.08	Q
1+50	0.0110	0.09	Q
1+55	0.0116	0.09	Q
2+ 0	0.0123	0.10	Q
2+ 5	0.0131	0.11	Q
2+10	0.0138	0.11	Q
2+15	0.0145	0.11	Q
2+20	0.0153	0.11	QV
2+25	0.0160	0.11	QV
2+30	0.0168	0.11	QV
2+35	0.0176	0.11	QV
2+40	0.0184	0.12	QV
2+45	0.0193	0.13	QV
2+50	0.0202	0.13	QV
2+55	0.0211	0.13	QV
3+ 0	0.0220	0.14	QV
3+ 5	0.0230	0.14	QV
3+10	0.0239	0.14	QV
3+15	0.0249	0.14	QV
3+20	0.0258	0.14	QV
3+25	0.0268	0.14	QV
3+30	0.0277	0.14	QV
3+35	0.0287	0.14	QV
3+40	0.0296	0.14	Q V
3+45	0.0306	0.14	Q V
3+50	0.0316	0.14	Q V
3+55	0.0326	0.15	Q V
4+ 0	0.0337	0.16	Q V
4+ 5	0.0348	0.16	Q V
4+10	0.0359	0.16	Q V
4+15	0.0370	0.16	Q V
4+20	0.0382	0.17	Q V
4+25	0.0394	0.17	Q V
4+30	0.0406	0.18	Q V
4+35	0.0419	0.19	Q V
4+40	0.0432	0.19	Q V
4+45	0.0445	0.19	Q V
4+50	0.0459	0.19	Q V
4+55	0.0473	0.20	Q V
5+ 0	0.0487	0.21	Q V
5+ 5	0.0502	0.21	Q V
5+10	0.0515	0.20	Q V
5+15	0.0528	0.18	Q V
5+20	0.0540	0.18	Q V
5+25	0.0553	0.18	Q V
5+30	0.0566	0.19	Q V
5+35	0.0580	0.19	Q V
5+40	0.0594	0.20	Q V
5+45	0.0608	0.21	Q V
5+50	0.0623	0.22	Q V
5+55	0.0638	0.22	Q V
6+ 0	0.0653	0.22	Q V

6+ 5	0.0668	0.22	Q V
6+10	0.0684	0.23	Q V
6+15	0.0701	0.24	Q V
6+20	0.0717	0.24	Q V
6+25	0.0734	0.24	Q V
6+30	0.0751	0.25	Q V
6+35	0.0768	0.25	Q V
6+40	0.0786	0.26	Q V
6+45	0.0804	0.27	Q V
6+50	0.0823	0.27	Q V
6+55	0.0842	0.27	Q V
7+ 0	0.0861	0.27	Q V
7+ 5	0.0880	0.28	Q V
7+10	0.0899	0.28	Q V
7+15	0.0918	0.28	Q V
7+20	0.0937	0.28	Q V
7+25	0.0957	0.29	Q V
7+30	0.0977	0.30	Q V
7+35	0.0998	0.30	Q V
7+40	0.1019	0.31	Q V
7+45	0.1041	0.32	Q V
7+50	0.1064	0.33	Q V
7+55	0.1087	0.34	Q V
8+ 0	0.1111	0.35	Q V
8+ 5	0.1135	0.35	Q V
8+10	0.1161	0.37	Q V
8+15	0.1188	0.39	Q V
8+20	0.1216	0.40	Q V
8+25	0.1243	0.40	Q V
8+30	0.1272	0.41	Q V
8+35	0.1300	0.41	Q V
8+40	0.1329	0.42	Q V
8+45	0.1359	0.43	Q V
8+50	0.1389	0.44	Q V
8+55	0.1420	0.45	Q V
9+ 0	0.1451	0.46	Q V
9+ 5	0.1484	0.47	Q V
9+10	0.1517	0.48	Q V
9+15	0.1552	0.50	Q V
9+20	0.1587	0.51	Q V
9+25	0.1623	0.53	Q V
9+30	0.1660	0.54	Q V
9+35	0.1698	0.55	Q V
9+40	0.1736	0.56	Q V
9+45	0.1775	0.57	Q V
9+50	0.1815	0.57	Q V
9+55	0.1855	0.59	Q V
10+ 0	0.1896	0.60	Q V
10+ 5	0.1937	0.59	Q V
10+10	0.1974	0.54	Q V
10+15	0.2007	0.49	Q V
10+20	0.2039	0.46	Q V
10+25	0.2070	0.45	Q V
10+30	0.2101	0.44	Q V
10+35	0.2131	0.45	Q V
10+40	0.2164	0.48	Q V
10+45	0.2200	0.52	Q V
10+50	0.2237	0.53	Q V
10+55	0.2274	0.54	Q V
11+ 0	0.2311	0.54	Q V
11+ 5	0.2349	0.54	Q V
11+10	0.2386	0.54	Q V
11+15	0.2422	0.53	Q V
11+20	0.2459	0.53	Q V
11+25	0.2495	0.53	Q V
11+30	0.2532	0.53	Q V
11+35	0.2568	0.53	Q V
11+40	0.2604	0.51	Q V
11+45	0.2638	0.50	Q V
11+50	0.2672	0.49	Q V
11+55	0.2706	0.49	Q V

12+ 0	0.2740	0.50	Q	V				17+55	0.5444	0.13	Q
12+ 5	0.2775	0.51	Q	V				18+ 0	0.5452	0.12	Q
12+10	0.2815	0.57	Q	V				18+ 5	0.5460	0.12	Q
12+15	0.2857	0.62	Q	V				18+10	0.5468	0.12	Q
12+20	0.2902	0.65	Q	V				18+15	0.5476	0.12	Q
12+25	0.2948	0.67	Q	V				18+20	0.5484	0.11	Q
12+30	0.2996	0.69	Q	V				18+25	0.5492	0.11	Q
12+35	0.3044	0.70	Q	V				18+30	0.5500	0.11	Q
12+40	0.3094	0.72	Q	V				18+35	0.5507	0.11	Q
12+45	0.3145	0.74	Q	V				18+40	0.5514	0.10	Q
12+50	0.3197	0.76	Q	V				18+45	0.5521	0.09	Q
12+55	0.3250	0.77	Q	V				18+50	0.5527	0.09	Q
13+ 0	0.3304	0.78	Q	V				18+55	0.5533	0.08	Q
13+ 5	0.3360	0.81	Q	V				19+ 0	0.5537	0.07	Q
13+10	0.3421	0.89	Q	V				19+ 5	0.5542	0.07	Q
13+15	0.3489	0.98	Q	V				19+10	0.5547	0.07	Q
13+20	0.3560	1.03	Q	V				19+15	0.5553	0.08	Q
13+25	0.3634	1.06	Q	V				19+20	0.5558	0.08	Q
13+30	0.3709	1.09	Q	V				19+25	0.5565	0.09	Q
13+35	0.3783	1.08	Q	V				19+30	0.5571	0.10	Q
13+40	0.3849	0.95	Q	V				19+35	0.5578	0.10	Q
13+45	0.3905	0.81	Q	V				19+40	0.5585	0.10	Q
13+50	0.3956	0.75	Q	V				19+45	0.5591	0.09	Q
13+55	0.4006	0.72	Q	V				19+50	0.5597	0.09	Q
14+ 0	0.4055	0.70	Q	V				19+55	0.5602	0.08	Q
14+ 5	0.4103	0.70	Q	V				20+ 0	0.5607	0.07	Q
14+10	0.4152	0.72	Q	V				20+ 5	0.5611	0.07	Q
14+15	0.4203	0.74	Q	V				20+10	0.5616	0.07	Q
14+20	0.4254	0.75	Q	V				20+15	0.5622	0.08	Q
14+25	0.4305	0.74	Q	V				20+20	0.5627	0.08	Q
14+30	0.4356	0.73	Q	V				20+25	0.5633	0.08	Q
14+35	0.4406	0.73	Q	V				20+30	0.5639	0.08	Q
14+40	0.4456	0.73	Q	V				20+35	0.5644	0.08	Q
14+45	0.4506	0.73	Q	V				20+40	0.5650	0.08	Q
14+50	0.4556	0.72	Q	V				20+45	0.5656	0.08	Q
14+55	0.4605	0.71	Q	V				20+50	0.5661	0.08	Q
15+ 0	0.4653	0.71	Q	V				20+55	0.5666	0.07	Q
15+ 5	0.4702	0.70	Q	V				21+ 0	0.5671	0.07	Q
15+10	0.4750	0.69	Q	V				21+ 5	0.5675	0.06	Q
15+15	0.4797	0.68	Q	V				21+10	0.5680	0.07	Q
15+20	0.4843	0.68	Q	V				21+15	0.5685	0.08	Q
15+25	0.4889	0.67	Q	V				21+20	0.5691	0.08	Q
15+30	0.4935	0.66	Q	V				21+25	0.5696	0.07	Q
15+35	0.4979	0.65	Q	V				21+30	0.5700	0.06	Q
15+40	0.5021	0.61	Q	V				21+35	0.5704	0.06	Q
15+45	0.5061	0.58	Q	V				21+40	0.5709	0.07	Q
15+50	0.5100	0.56	Q	V				21+45	0.5714	0.08	Q
15+55	0.5138	0.55	Q	V				21+50	0.5720	0.08	Q
16+ 0	0.5176	0.55	Q	V				21+55	0.5725	0.07	Q
16+ 5	0.5211	0.52	Q	V				22+ 0	0.5729	0.06	Q
16+10	0.5239	0.40	Q	V				22+ 5	0.5733	0.06	Q
16+15	0.5258	0.28	Q	V				22+10	0.5738	0.07	Q
16+20	0.5273	0.22	Q	V				22+15	0.5743	0.08	Q
16+25	0.5287	0.19	Q	V				22+20	0.5748	0.08	Q
16+30	0.5298	0.17	Q	V				22+25	0.5753	0.07	Q
16+35	0.5309	0.16	Q	V				22+30	0.5758	0.06	Q
16+40	0.5319	0.14	Q	V				22+35	0.5762	0.06	Q
16+45	0.5327	0.12	Q	V				22+40	0.5766	0.06	Q
16+50	0.5334	0.11	Q	V				22+45	0.5770	0.06	Q
16+55	0.5342	0.10	Q	V				22+50	0.5774	0.06	Q
17+ 0	0.5348	0.10	Q	V				22+55	0.5778	0.06	Q
17+ 5	0.5355	0.10	Q	V				23+ 0	0.5782	0.06	Q
17+10	0.5363	0.11	Q	V				23+ 5	0.5786	0.06	Q
17+15	0.5371	0.12	Q	V				23+10	0.5790	0.06	Q
17+20	0.5380	0.13	Q	V				23+15	0.5794	0.06	Q
17+25	0.5389	0.13	Q	V				23+20	0.5797	0.06	Q
17+30	0.5398	0.13	Q	V				23+25	0.5801	0.06	Q
17+35	0.5407	0.13	Q	V				23+30	0.5805	0.06	Q
17+40	0.5416	0.14	Q	V				23+35	0.5809	0.06	Q
17+45	0.5426	0.14	Q	V				23+40	0.5813	0.06	Q
17+50	0.5435	0.14	Q	V				23+45	0.5817	0.06	Q

23+50	0.5821	0.06	Q	|	|	|	V|
23+55	0.5824	0.06	Q	|	|	|	V|
24+ 0	0.5828	0.06	Q	|	|	|	V|
24+ 5	0.5832	0.05	Q	|	|	|	V|
24+10	0.5834	0.04	Q	|	|	|	V|
24+15	0.5836	0.02	Q	|	|	|	V|
24+20	0.5837	0.01	Q	|	|	|	V|
24+25	0.5837	0.01	Q	|	|	|	V|
24+30	0.5838	0.01	Q	|	|	|	V|
24+35	0.5838	0.01	Q	|	|	|	V|
24+40	0.5839	0.00	Q	|	|	|	V|
24+45	0.5839	0.00	Q	|	|	|	V|
24+50	0.5839	0.00	Q	|	|	|	V|
24+55	0.5839	0.00	Q	|	|	|	V|
25+ 0	0.5839	0.00	Q	|	|	|	V|
25+ 5	0.5839	0.00	Q	|	|	|	V|
25+10	0.5839	0.00	Q	|	|	|	V|
25+15	0.5840	0.00	Q	|	|	|	V|

APPENDIX C.4: 100-YEAR STORM EVENT

1-HOUR STORM DURATION

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
Study date 01/31/18 File: ARAPRE1100.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used
English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
EXISTING CONDITION
FN: ARAPRE

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areaal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(Ft.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.163 Hr.
Lag time = 9.75 Min.
25% of lag time = 2.44 Min.
40% of lag time = 3.90 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	0.45	5.17

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.20	13.80

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.450(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 1.200(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.200(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 71.00 0.161
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
71.0	71.0	0.350	0.161	0.299	1.000	0.299
						Sum (F) = 0.299

Area averaged mean soil loss (F) (In/Hr) = 0.299

Minimum soil loss rate ((In/Hr)) = 0.150
(for 24 hour storm duration)

Soil loss rate (decimal) = 0.771

Slope of intensity-duration curve for a 1 hour storm = 0.5000

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
------------------------	---------------	----------------------	-----------------------

1	0.083	51.266	6.366	0.738
2	0.167	102.533	27.222	3.155
3	0.250	153.799	28.703	3.327
4	0.333	205.065	12.516	1.451
5	0.417	256.331	6.680	0.774
6	0.500	307.598	4.653	0.539
7	0.583	358.864	3.341	0.387
8	0.667	410.130	2.524	0.293
9	0.750	461.397	1.836	0.213
10	0.833	512.663	1.556	0.180
11	0.917	563.929	1.237	0.143
12	1.000	615.195	0.968	0.112
13	1.083	666.462	0.758	0.088
14	1.167	717.728	0.560	0.065
15	1.250	768.994	0.513	0.059
16	1.333	820.260	0.566	0.066
			Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(0.466)	Effective (In/Hr)
				Max | Low	
1	0.08	4.20	0.605	0.299 (0.466)	0.305
2	0.17	4.30	0.619	0.299 (0.477)	0.320
3	0.25	5.00	0.720	0.299 (0.555)	0.420
4	0.33	5.00	0.720	0.299 (0.555)	0.420
5	0.42	5.80	0.835	0.299 (0.644)	0.536
6	0.50	6.50	0.936	0.299 (0.722)	0.636
7	0.58	7.40	1.065	0.299 (0.822)	0.766
8	0.67	8.60	1.238	0.299 (0.955)	0.939
9	0.75	12.30	1.771	0.299 (1.366)	1.472
10	0.83	29.10	4.190	0.299 (3.231)	3.891
11	0.92	6.80	0.979	0.299 (0.755)	0.680
12	1.00	5.00	0.720	0.299 (0.555)	0.420
			(Loss Rate Not Used)		

Sum = 100.0 Sum = 10.8

Flood volume = Effective rainfall * 0.90(In)
times area 11.5(Ac.)/(1(In)/(Ft.)) = 0.9(Ac.Ft)

Total soil loss = 0.30(In)

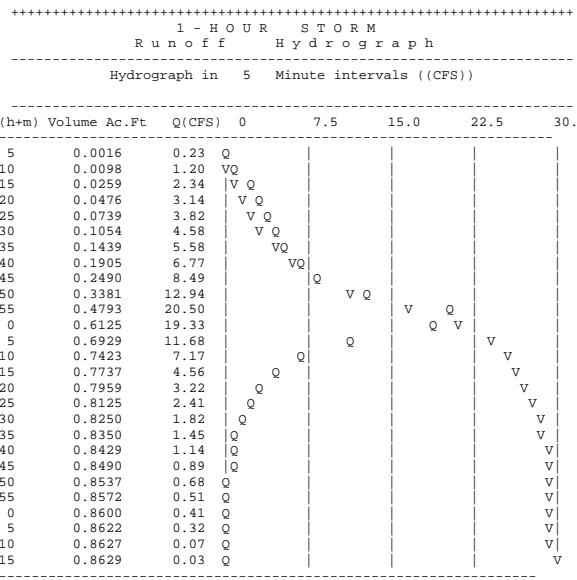
Total rainfall = 0.287(Ac.Ft)

Total rainfall = 1.20(In)

Flood volume = 37588.0 Cubic Feet

Total soil loss = 12500.8 Cubic Feet

Peak flow rate of this hydrograph = 20.501(CFS)



**APPENDIX D: POST-PROJECT CONDITION UNIT HYDROGRAPH HYDROLOGY
CALCULATIONS**

APPENDIX D.1: 2-YEAR STORM EVENT

1-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/30/18 File: ARAPOST12.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areaal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(Feet.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	0.45	5.17

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.20	13.80

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 0.450(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 0.450(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 0.450(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	33.5	0.729	0.681	0.282	1.000	0.282
						Sum (F) = 0.282

Area averaged mean soil loss (F) (In/Hr) = 0.282

Minimum soil loss rate ((In/Hr)) = 0.141
(for 24 hour storm duration)

Soil loss rate (decimal) = 0.355

Slope of intensity-duration curve for a 1 hour storm = 0.5000

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data			
Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)

1	0.083	102.533	19.977	2.315
2	0.167	205.065	48.572	5.629
3	0.250	307.598	15.265	1.769
4	0.333	410.130	6.930	0.803
5	0.417	512.663	3.876	0.449
6	0.500	615.195	2.499	0.290
7	0.583	717.728	1.522	0.176
8	0.667	820.260	1.359	0.158
			Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr.)	Effective (In/Hr)
			Max | Low	
1	0.08	4.20	0.227 (0.282)	0.081 0.146
2	0.17	4.30	0.232 (0.282)	0.082 0.150
3	0.25	5.00	0.270 (0.282)	0.096 0.174
4	0.33	5.00	0.270 (0.282)	0.096 0.174
5	0.42	5.80	0.313 (0.282)	0.111 0.202
6	0.50	6.50	0.351 (0.282)	0.125 0.226
7	0.58	7.40	0.400 (0.282)	0.142 0.258
8	0.67	8.60	0.464 (0.282)	0.165 0.299
9	0.75	12.30	0.664 (0.282)	0.236 0.428
10	0.83	29.10	1.571 (0.282)	0.282 (0.558) 1.289
11	0.92	6.80	0.367 (0.282)	0.130 0.237
12	1.00	5.00	0.270 (0.282)	0.096 0.174
			(Loss Rate Not Used)	
			Sum = 100.0	Sum = 3.8

Flood volume = Effective rainfall 0.31(In)
times area 11.5(Ac.)/(In)/(Ft.)] = 0.3(Ac.Ft)
Total soil loss = 0.14(In)
Total soil loss = 0.131(Ac.Ft)
Total rainfall = 0.45(In)
Flood volume = 13071.7 Cubic Feet
Total soil loss = 5711.6 Cubic Feet

Peak flow rate of this hydrograph = 9.052(CFS)

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1 - H O U R S T O R M

R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h:m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
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0+ 5	0.0023	0.34	VQ					
0+10	0.0104	1.17	V Q					
0+15	0.0208	1.51	V Q					
0+20	0.0329	1.77	V Q					
0+25	0.0463	1.94	VQ					
0+30	0.0616	2.22	| Q					
0+35	0.0789	2.52	| Q					
0+40	0.0988	2.89	| Q V					
0+45	0.1230	3.51	| Q V					
0+50	0.1667	6.35	| V Q					
0+55	0.2291	9.05	| V					
1+ 0	0.2611	4.64	| Q					
1+ 5	0.2803	2.80	| Q					
1+10	0.2892	1.30	| Q					
1+15	0.2944	0.74	| Q					
1+20	0.2974	0.44	| Q					
1+25	0.2994	0.30	| Q					
1+30	0.2999	0.07	Q					
1+35	0.3001	0.03	Q					

3-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/30/18 File: ARAPOST32.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(Feet.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	0.80	9.20

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.80	20.70

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.800(In)

Point rain (area averaged) = 0.800(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 0.800(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	33.5	0.729	0.681	0.282	1.000	0.282
					Sum (F)	0.282

Area averaged mean soil loss (F) (In/Hr) = 0.282

Minimum soil loss rate ((In/Hr)) = 0.141
(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.355

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	102.533	19.977	2.315
2	0.167	205.065	48.572	5.629
3	0.250	307.598	15.265	1.769
4	0.333	410.130	6.930	0.803
5	0.417	512.663	3.876	0.449
6	0.500	615.195	2.499	0.290
7	0.583	717.728	1.522	0.176
8	0.667	820.260	1.359	0.158
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate (In./Hr) Max | Low	Effective (In/Hr)
1	0.08	1.30	(0.282) 0.044	0.080
2	0.17	1.30	(0.282) 0.044	0.080
3	0.25	1.10	(0.282) 0.038	0.068
4	0.33	1.50	(0.282) 0.051	0.093
5	0.42	1.50	(0.282) 0.051	0.093
6	0.50	1.80	(0.282) 0.061	0.111
7	0.58	1.50	(0.282) 0.051	0.093
8	0.67	1.80	(0.282) 0.061	0.111
9	0.75	1.80	(0.282) 0.061	0.111
10	0.83	1.50	(0.282) 0.051	0.093
11	0.92	1.60	(0.282) 0.055	0.099
12	1.00	1.80	(0.282) 0.061	0.111
13	1.08	2.20	(0.282) 0.075	0.136
14	1.17	2.20	(0.282) 0.075	0.136
15	1.25	2.20	(0.282) 0.075	0.136
16	1.33	2.00	(0.282) 0.068	0.124
17	1.42	2.60	(0.282) 0.089	0.161
18	1.50	2.70	(0.282) 0.092	0.167
19	1.58	2.40	(0.282) 0.082	0.149
20	1.67	2.70	(0.282) 0.092	0.167
21	1.75	3.30	(0.282) 0.113	0.204
22	1.83	3.10	(0.282) 0.106	0.192
23	1.92	2.90	(0.282) 0.099	0.180
24	2.00	3.00	(0.282) 0.102	0.186
25	2.08	3.10	(0.282) 0.106	0.192
26	2.17	4.20	(0.282) 0.143	0.260
27	2.25	5.00	(0.282) 0.170	0.309
28	2.33	3.50	(0.282) 0.119	0.217
29	2.42	6.80	(0.282) 0.232	0.421
30	2.50	7.30	(0.282) 0.249	0.452
31	2.58	8.20	(0.282) 0.280	0.508
32	2.67	5.90	(0.282) 0.201	0.365
33	2.75	2.00	(0.282) 0.068	0.124
34	2.83	1.80	(0.282) 0.061	0.111

35 2.92 1.80 0.173 (0.282) 0.061 0.111
 36 3.00 0.60 0.058 (0.282) 0.020 0.037
 (Loss Rate Not Used)

Sum =	100.0	Sum =	6.2
Flood volume =	Effective rainfall	0.52(In)	
times area	11.5(Ac.)/(In)/(Ft.)	=	0.5(Ac.Ft)
Total soil loss =	0.28(In)		
Total soil loss =	0.272(Ac.Ft)		
Total rainfall =	0.80(In)		
Flood volume =	21532.7 Cubic Feet		
Total soil loss =	11861.7 Cubic Feet		

Peak flow rate of this hydrograph = 5.106(CFS)

3 - H O U R S T O R M

R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h:m)	Volume	Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0013	0.19	Q					
0+10	0.0057	0.64	V Q					
0+15	0.0109	0.75	V Q					
0+20	0.0164	0.81	| V Q					
0+25	0.0230	0.96	| V Q					
0+30	0.0303	1.06	| V Q					
0+35	0.0382	1.15	| V Q					
0+40	0.0461	1.14	| V Q					
0+45	0.0546	1.23	| Q					
0+50	0.0630	1.22	| QV					
0+55	0.0709	1.14	| QV					
1+ 0	0.0790	1.18	| Q V					
1+ 5	0.0880	1.31	| O V					
1+10	0.0981	1.47	| Q V					
1+15	0.1086	1.52	| Q V					
1+20	0.1191	1.52	| Q V					
1+25	0.1297	1.55	| Q V					
1+30	0.1418	1.76	| Q | V					
1+35	0.1543	1.81	| Q | V					
1+40	0.1666	1.79	| Q | V					
1+45	0.1802	1.97	| Q | V					
1+50	0.1951	2.18	| Q | V					
1+55	0.2100	2.16	| Q | V					
2+ 0	0.2246	2.12	| Q | V					
2+ 5	0.2394	2.16	| Q | V					
2+10	0.2556	2.35	| Q | V					
2+15	0.2754	2.87	| Q | V					
2+20	0.2965	3.06	| Q | V					
2+25	0.3182	3.15	| Q | V					
2+30	0.3477	4.28	| Q | V					
2+35	0.3815	4.92	| Q | V					
2+40	0.4167	5.11	| Q | V					
2+45	0.4439	3.95	| Q | V					
2+50	0.4606	2.42	| Q | V					
2+55	0.4735	1.87	| Q | V					
3+ 0	0.4836	1.47	| Q | V					
3+ 5	0.4892	0.82	| Q | V					
3+10	0.4919	0.39	| Q | V					
3+15	0.4932	0.19	| Q | V					
3+20	0.4938	0.09	| Q | V					
3+25	0.4941	0.05	| Q | V					
3+30	0.4943	0.02	Q V					
3+35	0.4943	0.01	Q V					

6-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/30/18 File: ARAPOST62.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(Ft.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 1.00 11.50

100 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 2.50 28.75

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 1.000(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 1.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.000(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	33.5	0.729	0.681	0.282	1.000	0.282
					Sum (F)	0.282

Area averaged mean soil loss (F) (In/Hr) = 0.282

Minimum soil loss rate ((In/Hr)) = 0.141
(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.355

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	102.533	19.977	2.315
2	0.167	205.065	48.572	5.629
3	0.250	307.598	15.265	1.769
4	0.333	410.130	6.930	0.803
5	0.417	512.663	3.876	0.449
6	0.500	615.195	2.499	0.290
7	0.583	717.728	1.522	0.176
8	0.667	820.260	1.359	0.158
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(0.282)	Effective (In/Hr)
1	0.08	0.060	(0.282)	0.021 0.039
2	0.17	0.072	(0.282)	0.026 0.046
3	0.25	0.072	(0.282)	0.026 0.046
4	0.33	0.072	(0.282)	0.026 0.046
5	0.42	0.072	(0.282)	0.026 0.046
6	0.50	0.084	(0.282)	0.030 0.054
7	0.58	0.084	(0.282)	0.030 0.054
8	0.67	0.084	(0.282)	0.030 0.054
9	0.75	0.084	(0.282)	0.030 0.054
10	0.83	0.084	(0.282)	0.030 0.054
11	0.92	0.084	(0.282)	0.030 0.054
12	1.00	0.096	(0.282)	0.034 0.062
13	1.08	0.096	(0.282)	0.034 0.062
14	1.17	0.096	(0.282)	0.034 0.062
15	1.25	0.096	(0.282)	0.034 0.062
16	1.33	0.096	(0.282)	0.034 0.062
17	1.42	0.096	(0.282)	0.034 0.062
18	1.50	0.096	(0.282)	0.034 0.062
19	1.58	0.096	(0.282)	0.034 0.062
20	1.67	0.096	(0.282)	0.034 0.062
21	1.75	0.096	(0.282)	0.034 0.062
22	1.83	0.096	(0.282)	0.034 0.062
23	1.92	0.096	(0.282)	0.034 0.062
24	2.00	0.108	(0.282)	0.038 0.070
25	2.08	0.108	(0.282)	0.034 0.062
26	2.17	0.108	(0.282)	0.038 0.070
27	2.25	0.108	(0.282)	0.038 0.070
28	2.33	0.108	(0.282)	0.038 0.070
29	2.42	0.108	(0.282)	0.038 0.070
30	2.50	0.108	(0.282)	0.038 0.070
31	2.58	0.108	(0.282)	0.038 0.070
32	2.67	0.108	(0.282)	0.038 0.070
33	2.75	1.00	(0.282)	0.043 0.077
34	2.83	1.00	(0.282)	0.043 0.077

24-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/30/18 File: ARAPOST242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(FT.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.60	18.40

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	4.10	47.15

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.100(In)

Point rain (area averaged) = 1.600(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.600(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	33.5	0.729	0.681	0.282	1.000	0.282
					Sum (F) =	0.282

Area averaged mean soil loss (F) (In/Hr) = 0.282

Minimum soil loss rate ((In/Hr)) = 0.141
(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.355

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	102.533	19.977	2.315
2	0.167	205.065	48.572	5.629
3	0.250	307.598	15.265	1.769
4	0.333	410.130	6.930	0.803
5	0.417	512.663	3.876	0.449
6	0.500	615.195	2.499	0.290
7	0.583	717.728	1.522	0.176
8	0.667	820.260	1.359	0.158
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max | Low	Effective (In/Hr)
1	0.08	0.07	(0.500)	0.005 0.008
2	0.17	0.07	(0.498)	0.005 0.008
3	0.25	0.07	(0.496)	0.005 0.008
4	0.33	0.10	(0.494)	0.007 0.012
5	0.42	0.10	(0.492)	0.007 0.012
6	0.50	0.10	(0.490)	0.007 0.012
7	0.58	0.10	(0.488)	0.007 0.012
8	0.67	0.10	(0.487)	0.007 0.012
9	0.75	0.10	(0.485)	0.007 0.012
10	0.83	0.13	(0.483)	0.009 0.017
11	0.92	0.13	(0.481)	0.009 0.017
12	1.00	0.13	(0.479)	0.009 0.017
13	1.08	0.10	(0.477)	0.007 0.012
14	1.17	0.10	(0.475)	0.007 0.012
15	1.25	0.10	(0.473)	0.007 0.012
16	1.33	0.10	(0.471)	0.007 0.012
17	1.42	0.10	(0.470)	0.007 0.012
18	1.50	0.10	(0.468)	0.007 0.012
19	1.58	0.10	(0.466)	0.007 0.012
20	1.67	0.10	(0.464)	0.007 0.012
21	1.75	0.10	(0.462)	0.007 0.012
22	1.83	0.13	(0.460)	0.009 0.017
23	1.92	0.13	(0.458)	0.009 0.017
24	2.00	0.13	(0.457)	0.009 0.017
25	2.08	0.13	(0.455)	0.009 0.017
26	2.17	0.13	(0.453)	0.009 0.017
27	2.25	0.13	(0.451)	0.009 0.017
28	2.33	0.13	(0.449)	0.009 0.017
29	2.42	0.13	(0.447)	0.009 0.017
30	2.50	0.13	(0.445)	0.009 0.017
31	2.58	0.17	(0.444)	0.011 0.021
32	2.67	0.17	(0.442)	0.011 0.021
33	2.75	0.17	(0.440)	0.011 0.021
34	2.83	0.17	(0.438)	0.011 0.021

35	2.92	0.17	0.032	(0.436)	0.011	0.021		106	8.83	0.57	0.109	(0.319)	0.039	0.070
36	3.00	0.17	0.032	(0.435)	0.011	0.021		107	8.92	0.57	0.109	(0.317)	0.039	0.070
37	3.08	0.17	0.032	(0.433)	0.011	0.021		108	9.00	0.57	0.109	(0.316)	0.039	0.070
38	3.17	0.17	0.032	(0.431)	0.011	0.021		109	9.08	0.63	0.122	(0.314)	0.043	0.078
39	3.25	0.17	0.032	(0.429)	0.011	0.021		110	9.17	0.63	0.122	(0.313)	0.043	0.078
40	3.33	0.17	0.032	(0.427)	0.011	0.021		111	9.25	0.63	0.122	(0.311)	0.043	0.078
41	3.42	0.17	0.032	(0.426)	0.011	0.021		112	9.33	0.67	0.128	(0.310)	0.045	0.083
42	3.50	0.17	0.032	(0.424)	0.011	0.021		113	9.42	0.67	0.128	(0.308)	0.045	0.083
43	3.58	0.17	0.032	(0.422)	0.011	0.021		114	9.50	0.67	0.128	(0.307)	0.045	0.083
44	3.67	0.17	0.032	(0.420)	0.011	0.021		115	9.58	0.70	0.134	(0.305)	0.048	0.087
45	3.75	0.17	0.032	(0.419)	0.011	0.021		116	9.67	0.70	0.134	(0.304)	0.048	0.087
46	3.83	0.20	0.038	(0.417)	0.014	0.025		117	9.75	0.70	0.134	(0.302)	0.048	0.087
47	3.92	0.20	0.038	(0.415)	0.014	0.025		118	9.83	0.73	0.141	(0.301)	0.050	0.091
48	4.00	0.20	0.038	(0.413)	0.014	0.025		119	9.92	0.73	0.141	(0.299)	0.050	0.091
49	4.08	0.20	0.038	(0.412)	0.014	0.025		120	10.00	0.73	0.141	(0.298)	0.050	0.091
50	4.17	0.20	0.038	(0.410)	0.014	0.025		121	10.08	0.50	0.096	(0.296)	0.034	0.062
51	4.25	0.20	0.038	(0.408)	0.014	0.025		122	10.17	0.50	0.096	(0.295)	0.034	0.062
52	4.33	0.23	0.045	(0.406)	0.016	0.029		123	10.25	0.50	0.096	(0.294)	0.034	0.062
53	4.42	0.23	0.045	(0.405)	0.016	0.029		124	10.33	0.50	0.096	(0.292)	0.034	0.062
54	4.50	0.23	0.045	(0.403)	0.016	0.029		125	10.42	0.50	0.096	(0.291)	0.034	0.062
55	4.58	0.23	0.045	(0.401)	0.016	0.029		126	10.50	0.50	0.096	(0.289)	0.034	0.062
56	4.67	0.23	0.045	(0.399)	0.016	0.029		127	10.58	0.67	0.128	(0.288)	0.045	0.083
57	4.75	0.23	0.045	(0.398)	0.016	0.029		128	10.67	0.67	0.128	(0.286)	0.045	0.083
58	4.83	0.27	0.051	(0.396)	0.018	0.033		129	10.75	0.67	0.128	(0.285)	0.045	0.083
59	4.92	0.27	0.051	(0.394)	0.018	0.033		130	10.83	0.67	0.128	(0.284)	0.045	0.083
60	5.00	0.27	0.051	(0.393)	0.018	0.033		131	10.92	0.67	0.128	(0.282)	0.045	0.083
61	5.08	0.20	0.038	(0.391)	0.014	0.025		132	11.00	0.67	0.128	(0.281)	0.045	0.083
62	5.17	0.20	0.038	(0.389)	0.014	0.025		133	11.08	0.63	0.122	(0.280)	0.043	0.078
63	5.25	0.20	0.038	(0.387)	0.014	0.025		134	11.17	0.63	0.122	(0.278)	0.043	0.078
64	5.33	0.23	0.045	(0.386)	0.016	0.029		135	11.25	0.63	0.122	(0.277)	0.043	0.078
65	5.42	0.23	0.045	(0.384)	0.016	0.029		136	11.33	0.63	0.122	(0.275)	0.043	0.078
66	5.50	0.23	0.045	(0.382)	0.016	0.029		137	11.42	0.63	0.122	(0.274)	0.043	0.078
67	5.58	0.27	0.051	(0.381)	0.018	0.033		138	11.50	0.63	0.122	(0.273)	0.043	0.078
68	5.67	0.27	0.051	(0.379)	0.018	0.033		139	11.58	0.57	0.109	(0.271)	0.039	0.070
69	5.75	0.27	0.051	(0.377)	0.018	0.033		140	11.67	0.57	0.109	(0.270)	0.039	0.070
70	5.83	0.27	0.051	(0.376)	0.018	0.033		141	11.75	0.57	0.109	(0.269)	0.039	0.070
71	5.92	0.27	0.051	(0.374)	0.018	0.033		142	11.83	0.60	0.115	(0.267)	0.041	0.074
72	6.00	0.27	0.051	(0.372)	0.018	0.033		143	11.92	0.60	0.115	(0.266)	0.041	0.074
73	6.08	0.30	0.058	(0.371)	0.020	0.037		144	12.00	0.60	0.115	(0.265)	0.041	0.074
74	6.17	0.30	0.058	(0.369)	0.020	0.037		145	12.08	0.83	0.160	(0.263)	0.057	0.103
75	6.25	0.30	0.058	(0.367)	0.020	0.037		146	12.17	0.83	0.160	(0.262)	0.057	0.103
76	6.33	0.30	0.058	(0.366)	0.020	0.037		147	12.25	0.83	0.160	(0.261)	0.057	0.103
77	6.42	0.30	0.058	(0.364)	0.020	0.037		148	12.33	0.87	0.166	(0.259)	0.059	0.107
78	6.50	0.30	0.058	(0.362)	0.020	0.037		149	12.42	0.87	0.166	(0.258)	0.059	0.107
79	6.58	0.33	0.064	(0.361)	0.023	0.041		150	12.50	0.87	0.166	(0.257)	0.059	0.107
80	6.67	0.33	0.064	(0.359)	0.023	0.041		151	12.58	0.93	0.179	(0.255)	0.064	0.116
81	6.75	0.33	0.064	(0.358)	0.023	0.041		152	12.67	0.93	0.179	(0.254)	0.064	0.116
82	6.83	0.33	0.064	(0.356)	0.023	0.041		153	12.75	0.93	0.179	(0.253)	0.064	0.116
83	6.92	0.33	0.064	(0.354)	0.023	0.041		154	12.83	0.97	0.186	(0.252)	0.066	0.120
84	7.00	0.33	0.064	(0.353)	0.023	0.041		155	12.92	0.97	0.186	(0.250)	0.066	0.120
85	7.08	0.33	0.064	(0.351)	0.023	0.041		156	13.00	0.97	0.186	(0.249)	0.066	0.120
86	7.17	0.33	0.064	(0.350)	0.023	0.041		157	13.08	1.13	0.218	(0.248)	0.077	0.140
87	7.25	0.33	0.064	(0.348)	0.023	0.041		158	13.17	1.13	0.218	(0.247)	0.077	0.140
88	7.33	0.37	0.070	(0.346)	0.025	0.045		159	13.25	1.13	0.218	(0.245)	0.077	0.140
89	7.42	0.37	0.070	(0.345)	0.025	0.045		160	13.33	1.13	0.218	(0.244)	0.077	0.140
90	7.50	0.37	0.070	(0.343)	0.025	0.045		161	13.42	1.13	0.218	(0.243)	0.077	0.140
91	7.58	0.40	0.077	(0.342)	0.027	0.050		162	13.50	1.13	0.218	(0.242)	0.077	0.140
92	7.67	0.40	0.077	(0.340)	0.027	0.050		163	13.58	0.77	0.147	(0.240)	0.052	0.095
93	7.75	0.40	0.077	(0.338)	0.027	0.050		164	13.67	0.77	0.147	(0.239)	0.052	0.095
94	7.83	0.43	0.083	(0.337)	0.030	0.054		165	13.75	0.77	0.147	(0.238)	0.052	0.095
95	7.92	0.43	0.083	(0.335)	0.030	0.054		166	13.83	0.77	0.147	(0.237)	0.052	0.095
96	8.00	0.43	0.083	(0.334)	0.030	0.054		167	13.92	0.77	0.147	(0.236)	0.052	0.095
97	8.08	0.50	0.096	(0.332)	0.034	0.062		168	14.00	0.77	0.147	(0.234)	0.052	0.095
98	8.17	0.50	0.096	(0.331)	0.034	0.062		169	14.08	0.90	0.173	(0.233)	0.061	0.111
99	8.25	0.50	0.096	(0.329)	0.034	0.062		170	14.17	0.90	0.173	(0.232)	0.061	0.111
100	8.33	0.50	0.096	(0.328)	0.034	0.062		171	14.25	0.90	0.173	(0.231)	0.061	0.111
101	8.42	0.50	0.096	(0.326)	0.034	0.062		172	14.33	0.87	0.166	(0.230)	0.059	0.107
102	8.50	0.50	0.096	(0.325)	0.034	0.062		173	14.42	0.87	0.166	(0.228)	0.059	0.107
103	8.58	0.53	0.102	(0.323)	0.036	0.066		174	14.50	0.87	0.166	(0.227)	0.059	0.107
104	8.67	0.53	0.102	(0.322)	0.036	0.066		175	14.58	0.87	0.166	(0.226)	0.059	0.107
105	8.75	0.53	0.102	(0.320)	0.036	0.066		176	14.67	0.87	0.166	(0.225)	0.059	0.107

177	14.75	0.87	0.166	(0.224)	0.059	0.107			248	20.67	0.10	0.019	(0.158)	0.007	0.012
178	14.83	0.83	0.160	(0.223)	0.057	0.103			249	20.75	0.10	0.019	(0.158)	0.007	0.012
179	14.92	0.83	0.160	(0.221)	0.057	0.103			250	20.83	0.07	0.013	(0.157)	0.005	0.008
180	15.00	0.83	0.160	(0.220)	0.057	0.103			251	20.92	0.07	0.013	(0.156)	0.005	0.008
181	15.08	0.80	0.154	(0.219)	0.055	0.099			252	21.00	0.07	0.013	(0.156)	0.005	0.008
182	15.17	0.80	0.154	(0.218)	0.055	0.099			253	21.08	0.10	0.019	(0.155)	0.007	0.012
183	15.25	0.80	0.154	(0.217)	0.055	0.099			254	21.17	0.10	0.019	(0.154)	0.007	0.012
184	15.33	0.77	0.147	(0.216)	0.052	0.095			255	21.25	0.10	0.019	(0.154)	0.007	0.012
185	15.42	0.77	0.147	(0.215)	0.052	0.095			256	21.33	0.07	0.013	(0.153)	0.005	0.008
186	15.50	0.77	0.147	(0.214)	0.052	0.095			257	21.42	0.07	0.013	(0.153)	0.005	0.008
187	15.58	0.63	0.122	(0.213)	0.043	0.078			258	21.50	0.07	0.013	(0.152)	0.005	0.008
188	15.67	0.63	0.122	(0.211)	0.043	0.078			259	21.58	0.10	0.019	(0.152)	0.007	0.012
189	15.75	0.63	0.122	(0.210)	0.043	0.078			260	21.67	0.10	0.019	(0.151)	0.007	0.012
190	15.83	0.63	0.122	(0.209)	0.043	0.078			261	21.75	0.10	0.019	(0.150)	0.007	0.012
191	15.92	0.63	0.122	(0.208)	0.043	0.078			262	21.83	0.07	0.013	(0.150)	0.005	0.008
192	16.00	0.63	0.122	(0.207)	0.043	0.078			263	21.92	0.07	0.013	(0.149)	0.005	0.008
193	16.08	0.13	0.026	(0.206)	0.009	0.017			264	22.00	0.07	0.013	(0.149)	0.005	0.008
194	16.17	0.13	0.026	(0.205)	0.009	0.017			265	22.08	0.10	0.019	(0.148)	0.007	0.012
195	16.25	0.13	0.026	(0.204)	0.009	0.017			266	22.17	0.10	0.019	(0.148)	0.007	0.012
196	16.33	0.13	0.026	(0.203)	0.009	0.017			267	22.25	0.10	0.019	(0.147)	0.007	0.012
197	16.42	0.13	0.026	(0.202)	0.009	0.017			268	22.33	0.07	0.013	(0.147)	0.005	0.008
198	16.50	0.13	0.026	(0.201)	0.009	0.017			269	22.42	0.07	0.013	(0.147)	0.005	0.008
199	16.58	0.10	0.019	(0.200)	0.007	0.012			270	22.50	0.07	0.013	(0.146)	0.005	0.008
200	16.67	0.10	0.019	(0.199)	0.007	0.012			271	22.58	0.07	0.013	(0.146)	0.005	0.008
201	16.75	0.10	0.019	(0.198)	0.007	0.012			272	22.67	0.07	0.013	(0.145)	0.005	0.008
202	16.83	0.10	0.019	(0.197)	0.007	0.012			273	22.75	0.07	0.013	(0.145)	0.005	0.008
203	16.92	0.10	0.019	(0.196)	0.007	0.012			274	22.83	0.07	0.013	(0.145)	0.005	0.008
204	17.00	0.10	0.019	(0.195)	0.007	0.012			275	22.92	0.07	0.013	(0.144)	0.005	0.008
205	17.08	0.17	0.032	(0.194)	0.011	0.021			276	23.00	0.07	0.013	(0.144)	0.005	0.008
206	17.17	0.17	0.032	(0.193)	0.011	0.021			277	23.08	0.07	0.013	(0.143)	0.005	0.008
207	17.25	0.17	0.032	(0.192)	0.011	0.021			278	23.17	0.07	0.013	(0.143)	0.005	0.008
208	17.33	0.17	0.032	(0.191)	0.011	0.021			279	23.25	0.07	0.013	(0.143)	0.005	0.008
209	17.42	0.17	0.032	(0.190)	0.011	0.021			280	23.33	0.07	0.013	(0.143)	0.005	0.008
210	17.50	0.17	0.032	(0.189)	0.011	0.021			281	23.42	0.07	0.013	(0.142)	0.005	0.008
211	17.58	0.17	0.032	(0.188)	0.011	0.021			282	23.50	0.07	0.013	(0.142)	0.005	0.008
212	17.67	0.17	0.032	(0.187)	0.011	0.021			283	23.58	0.07	0.013	(0.142)	0.005	0.008
213	17.75	0.17	0.032	(0.186)	0.011	0.021			284	23.67	0.07	0.013	(0.142)	0.005	0.008
214	17.83	0.13	0.026	(0.185)	0.009	0.017			285	23.75	0.07	0.013	(0.141)	0.005	0.008
215	17.92	0.13	0.026	(0.184)	0.009	0.017			286	23.83	0.07	0.013	(0.141)	0.005	0.008
216	18.00	0.13	0.026	(0.183)	0.009	0.017			287	23.92	0.07	0.013	(0.141)	0.005	0.008
217	18.08	0.13	0.026	(0.182)	0.009	0.017			288	24.00	0.07	0.013	(0.141)	0.005	0.008
218	18.17	0.13	0.026	(0.181)	0.009	0.017									
219	18.25	0.13	0.026	(0.180)	0.009	0.017									
220	18.33	0.13	0.026	(0.179)	0.009	0.017									
221	18.42	0.13	0.026	(0.178)	0.009	0.017									
222	18.50	0.13	0.026	(0.177)	0.007	0.012									
223	18.58	0.10	0.019	(0.176)	0.007	0.012									
224	18.67	0.10	0.019	(0.176)	0.007	0.012									
225	18.75	0.10	0.019	(0.176)	0.007	0.012									
226	18.83	0.07	0.013	(0.175)	0.005	0.008									
227	18.92	0.07	0.013	(0.174)	0.005	0.008									
228	19.00	0.07	0.013	(0.173)	0.005	0.008									
229	19.08	0.10	0.019	(0.172)	0.007	0.012									
230	19.17	0.10	0.019	(0.171)	0.007	0.012									
231	19.25	0.10	0.019	(0.171)	0.007	0.012									
232	19.33	0.13	0.026	(0.170)	0.009	0.017									
233	19.42	0.13	0.026	(0.169)	0.009	0.017									
234	19.50	0.13	0.026	(0.168)	0.009	0.017									
235	19.58	0.10	0.019	(0.168)	0.007	0.012									
236	19.67	0.10	0.019	(0.167)	0.007	0.012									
237	19.75	0.10	0.019	(0.166)	0.007	0.012									
238	19.83	0.07	0.013	(0.165)	0.005	0.008									
239	19.92	0.07	0.013	(0.165)	0.005	0.008									
240	20.00	0.07	0.013	(0.164)	0.005	0.008									
241	20.08	0.10	0.019	(0.163)	0.007	0.012									
242	20.17	0.10	0.019	(0.162)	0.007	0.012									
243	20.25	0.10	0.019	(0.162)	0.007	0.012									
244	20.33	0.10	0.019	(0.161)	0.007	0.012									
245	20.42	0.10	0.019	(0.160)	0.007	0.012									
246	20.50	0.10	0.019	(0.160)	0.007	0.012									
247	20.58	0.10	0.019	(0.159)	0.007	0.012									

(Loss Rate Not Used)

Sum = 100.0 Sum = 12.4

Flood volume = Effective rainfall 1.03(In)
times area 11.5(Ac.)/(In)/(Ft.)] = 1.0(Ac.Ft)

Total soil loss = 0.57(In)
Total soil loss = 0.545(Ac.Ft)
Total rainfall = 1.60(In)
Flood volume = 43066.5 Cubic Feet
Total soil loss = 23724.0 Cubic Feet

Peak flow rate of this hydrograph = 1.620(CFS)

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24 - H O U R S T O R M
Runoff Hydrograph

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m) Volume Ac.Ft Q(CFS) 0 2.5 5.0 7.5 10.0

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0001		0.02	Q				
0+10	0.0006		0.07	Q				
0+15	0.0011		0.08	Q				
0+20	0.0018		0.10	Q				
0+25	0.0026		0.12	Q				
0+30	0.0036		0.13	Q				
0+35	0.0045		0.14	Q				
0+40	0.0055		0.14	Q				
0+45	0.0065		0.14	Q				

0+50	0.0075	0.15	Q			6+45	0.1425	0.47	|Q|V	
0+55	0.0087	0.18	Q			6+50	0.1458	0.47	|Q|V	
1+ 0	0.0100	0.18	Q			6+55	0.1491	0.48	|Q|V	
1+ 5	0.0112	0.18	Q			7+ 0	0.1524	0.48	|Q|V	
1+10	0.0123	0.16	Q			7+ 5	0.1557	0.48	|Q|V	
1+15	0.0133	0.15	Q			7+10	0.1590	0.48	|Q|V	
1+20	0.0143	0.15	Q			7+15	0.1623	0.48	|Q|V	
1+25	0.0153	0.15	Q			7+20	0.1656	0.49	|Q|V	
1+30	0.0163	0.14	Q			7+25	0.1691	0.51	|Q|V	
1+35	0.0173	0.14	Q			7+30	0.1727	0.52	|Q|V	
1+40	0.0183	0.14	Q			7+35	0.1764	0.53	|Q|V	
1+45	0.0193	0.14	Q			7+40	0.1802	0.56	|Q|V	
1+50	0.0204	0.15	Q			7+45	0.1841	0.57	|Q|V	
1+55	0.0216	0.18	Q			7+50	0.1881	0.58	|Q|V	
2+ 0	0.0228	0.18	Q			7+55	0.1922	0.60	|Q|V	
2+ 5	0.0241	0.19	Q			8+ 0	0.1965	0.61	|Q|V	
2+10	0.0254	0.19	QV			8+ 5	0.2008	0.64	|Q|V	
2+15	0.0267	0.19	QV			8+10	0.2056	0.69	|Q|V	
2+20	0.0281	0.19	QV			8+15	0.2104	0.70	|Q|V	
2+25	0.0294	0.19	QV			8+20	0.2153	0.71	|Q|V	
2+30	0.0307	0.19	QV			8+25	0.2202	0.71	|Q|V	
2+35	0.0321	0.20	QV			8+30	0.2251	0.72	|Q|V	
2+40	0.0336	0.22	QV			8+35	0.2301	0.73	|Q|V	
2+45	0.0352	0.23	QV			8+40	0.2353	0.75	|Q|V	
2+50	0.0368	0.23	QV			8+45	0.2405	0.76	|Q|V	
2+55	0.0385	0.24	QV			8+50	0.2458	0.77	|Q|V	
3+ 0	0.0401	0.24	QV			8+55	0.2513	0.80	|Q|V	
3+ 5	0.0417	0.24	QV			9+ 0	0.2568	0.80	|Q|V	
3+10	0.0434	0.24	QV			9+ 5	0.2625	0.83	|Q|V	
3+15	0.0450	0.24	QV			9+10	0.2686	0.88	|Q|V	
3+20	0.0467	0.24	QV			9+15	0.2747	0.89	|Q|V	
3+25	0.0483	0.24	QV			9+20	0.2810	0.91	|Q|V	
3+30	0.0500	0.24	Q V			9+25	0.2874	0.94	|Q|V	
3+35	0.0516	0.24	Q V			9+30	0.2939	0.95	|Q|V	
3+40	0.0533	0.24	Q V			9+35	0.3006	0.96	|Q|V	
3+45	0.0549	0.24	Q V			9+40	0.3074	0.99	|Q|V	
3+50	0.0566	0.25	Q V			9+45	0.3142	1.00	|Q|V	
3+55	0.0585	0.27	QV			9+50	0.3212	1.01	|Q|V	
4+ 0	0.0604	0.28	QV			9+55	0.3283	1.04	|Q|V	
4+ 5	0.0624	0.28	QV			10+ 0	0.3355	1.04	|Q|V	
4+10	0.0643	0.28	QV			10+ 5	0.3422	0.98	|Q|V	
4+15	0.0663	0.29	QV			10+10	0.3479	0.82	|Q|V	
4+20	0.0684	0.30	QV			10+15	0.3532	0.77	|Q|V	
4+25	0.0706	0.32	QV			10+20	0.3583	0.75	|Q|V	
4+30	0.0728	0.33	QV			10+25	0.3634	0.74	|Q|V	
4+35	0.0751	0.33	Q V			10+30	0.3684	0.73	|Q|V	
4+40	0.0774	0.33	Q V			10+35	0.3737	0.77	|Q|V	
4+45	0.0797	0.33	Q V			10+40	0.3798	0.88	|Q|V	
4+50	0.0820	0.34	Q V			10+45	0.3861	0.92	|Q|V	
4+55	0.0846	0.37	Q V			10+50	0.3926	0.93	|Q|V	
5+ 0	0.0872	0.38	Q V			10+55	0.3991	0.94	|Q|V	
5+ 5	0.0896	0.36	Q V			11+ 0	0.4056	0.95	|Q|V	
5+10	0.0918	0.31	Q V			11+ 5	0.4121	0.94	|Q|V	
5+15	0.0939	0.30	Q V			11+10	0.4185	0.92	|Q|V	
5+20	0.0960	0.30	Q V			11+15	0.4248	0.92	|Q|V	
5+25	0.0982	0.33	Q V			11+20	0.4311	0.91	|Q|V	
5+30	0.1005	0.33	Q V			11+25	0.4374	0.91	|Q|V	
5+35	0.1028	0.34	Q V			11+30	0.4436	0.91	|Q|V	
5+40	0.1053	0.37	Q V			11+35	0.4498	0.89	|Q|V	
5+45	0.1079	0.37	Q V			11+40	0.4556	0.84	|Q|V	
5+50	0.1105	0.38	Q V			11+45	0.4613	0.83	|Q|V	
5+55	0.1131	0.38	Q V			11+50	0.4670	0.83	|Q|V	
6+ 0	0.1158	0.38	Q V			11+55	0.4729	0.85	|Q|V	
6+ 5	0.1185	0.39	Q V			12+ 0	0.4788	0.86	|Q|V	
6+10	0.1213	0.42	Q V			12+ 5	0.4851	0.93	|Q|V	
6+15	0.1242	0.42	Q V			12+10	0.4926	1.09	|Q|V	
6+20	0.1272	0.43	Q V			12+15	0.5005	1.14	|Q|V	
6+25	0.1301	0.43	Q V			12+20	0.5086	1.17	|Q|V	
6+30	0.1331	0.43	Q V			12+25	0.5169	1.21	|Q|V	
6+35	0.1361	0.44	Q V			12+30	0.5254	1.23	|Q|V	
6+40	0.1393	0.46	Q V			12+35	0.5340	1.25	|Q|V	

12+40	0.5430	1.31	| Q	| V	|	|	18+35	0.9336	0.18	Q	|	|	V
12+45	0.5521	1.32	| Q	| V	|	|	18+40	0.9347	0.16	Q	|	|	V
12+50	0.5614	1.34	| Q	| V	|	|	18+45	0.9357	0.15	Q	|	|	V
12+55	0.5708	1.37	| Q	| V	|	|	18+50	0.9367	0.14	Q	|	|	V
13+ 0	0.5803	1.38	| Q	| V	|	|	18+55	0.9375	0.11	Q	|	|	V
13+ 5	0.5901	1.43	| Q	| V	|	|	19+ 0	0.9382	0.10	Q	|	|	V
13+10	0.6008	1.55	| Q	| V	|	|	19+ 5	0.9390	0.11	Q	|	|	V
13+15	0.6117	1.59	| Q	| V	|	|	19+10	0.9399	0.13	Q	|	|	V
13+20	0.6228	1.60	| Q	| V	|	|	19+15	0.9408	0.14	Q	|	|	V
13+25	0.6339	1.61	| Q	| V	|	|	19+20	0.9418	0.15	Q	|	|	V
13+30	0.6450	1.62	| Q	| V	|	|	19+25	0.9430	0.17	Q	|	|	V
13+35	0.6555	1.52	| Q	| V	|	|	19+30	0.9443	0.18	Q	|	|	V
13+40	0.6642	1.27	| Q	| V	|	|	19+35	0.9455	0.18	Q	|	|	V
13+45	0.6724	1.19	| Q	| V	|	|	19+40	0.9466	0.16	Q	|	|	V
13+50	0.6803	1.15	| Q	| V	|	|	19+45	0.9476	0.15	Q	|	|	V
13+55	0.6881	1.13	| Q	| V	|	|	19+50	0.9486	0.14	Q	|	|	V
14+ 0	0.6957	1.12	| Q	| V	|	|	19+55	0.9493	0.11	Q	|	|	V
14+ 5	0.7036	1.15	| Q	| V	|	|	20+ 0	0.9501	0.10	Q	|	|	V
14+10	0.7121	1.23	| Q	| V	|	|	20+ 5	0.9508	0.11	Q	|	|	V
14+15	0.7208	1.26	| Q	| V	|	|	20+10	0.9517	0.13	Q	|	|	V
14+20	0.7295	1.26	| Q	| V	|	|	20+15	0.9527	0.14	Q	|	|	V
14+25	0.7381	1.25	| Q	| V	|	|	20+20	0.9536	0.14	Q	|	|	V
14+30	0.7467	1.25	| Q	| V	|	|	20+25	0.9546	0.14	Q	|	|	V
14+35	0.7553	1.25	| Q	| V	|	|	20+30	0.9556	0.14	Q	|	|	V
14+40	0.7639	1.25	| Q	| V	|	|	20+35	0.9566	0.14	Q	|	|	V
14+45	0.7724	1.25	| Q	| V	|	|	20+40	0.9576	0.14	Q	|	|	V
14+50	0.7810	1.24	| Q	| V	|	|	20+45	0.9586	0.14	Q	|	|	V
14+55	0.7893	1.21	| Q	| V	|	|	20+50	0.9595	0.13	Q	|	|	V
15+ 0	0.7976	1.20	| Q	| V	|	|	20+55	0.9602	0.11	Q	|	|	V
15+ 5	0.8058	1.19	| Q	| V	|	|	21+ 0	0.9609	0.10	Q	|	|	V
15+10	0.8138	1.17	| Q	| V	|	|	21+ 5	0.9617	0.11	Q	|	|	V
15+15	0.8218	1.16	| Q	| V	|	|	21+10	0.9626	0.13	Q	|	|	V
15+20	0.8297	1.14	| Q	| V	|	|	21+15	0.9636	0.14	Q	|	|	V
15+25	0.8374	1.12	| Q	| V	|	|	21+20	0.9644	0.13	Q	|	|	V
15+30	0.8450	1.11	| Q	| V	|	|	21+25	0.9652	0.11	Q	|	|	V
15+35	0.8524	1.07	| Q	| V	|	|	21+30	0.9659	0.10	Q	|	|	V
15+40	0.8591	0.97	| Q	| V	|	|	21+35	0.9666	0.11	Q	|	|	V
15+45	0.8655	0.94	| Q	| V	|	|	21+40	0.9676	0.13	Q	|	|	V
15+50	0.8719	0.93	| Q	| V	|	|	21+45	0.9685	0.14	Q	|	|	V
15+55	0.8783	0.92	| Q	| V	|	|	21+50	0.9694	0.13	Q	|	|	V
16+ 0	0.8846	0.91	| Q	| V	|	|	21+55	0.9701	0.11	Q	|	|	V
16+ 5	0.8899	0.77	| Q	| V	|	|	22+ 0	0.9708	0.10	Q	|	|	V
16+10	0.8927	0.42	| Q	| V	|	|	22+ 5	0.9716	0.11	Q	|	|	V
16+15	0.8948	0.31	| Q	| V	|	|	22+10	0.9725	0.13	Q	|	|	V
16+20	0.8966	0.26	| Q	| V	|	|	22+15	0.9734	0.14	Q	|	|	V
16+25	0.8982	0.23	| Q	| V	|	|	22+20	0.9743	0.13	Q	|	|	V
16+30	0.8997	0.21	| Q	| V	|	|	22+25	0.9751	0.11	Q	|	|	V
16+35	0.9010	0.19	| Q	| V	|	|	22+30	0.9758	0.10	Q	|	|	V
16+40	0.9021	0.16	| Q	| V	|	|	22+35	0.9765	0.10	Q	|	|	V
16+45	0.9031	0.15	| Q	| V	|	|	22+40	0.9771	0.10	Q	|	|	V
16+50	0.9041	0.15	| Q	| V	|	|	22+45	0.9778	0.10	Q	|	|	V
16+55	0.9051	0.15	| Q	| V	|	|	22+50	0.9785	0.10	Q	|	|	V
17+ 0	0.9061	0.14	| Q	| V	|	|	22+55	0.9791	0.10	Q	|	|	V
17+ 5	0.9073	0.16	| Q	| V	|	|	23+ 0	0.9798	0.10	Q	|	|	V
17+10	0.9087	0.21	| Q	| V	|	|	23+ 5	0.9805	0.10	Q	|	|	V
17+15	0.9103	0.22	| Q	| V	|	|	23+10	0.9811	0.10	Q	|	|	V
17+20	0.9118	0.23	| Q	| V	|	|	23+15	0.9818	0.10	Q	|	|	V
17+25	0.9135	0.23	| Q	| V	|	|	23+20	0.9824	0.10	Q	|	|	V
17+30	0.9151	0.24	| Q	| V	|	|	23+25	0.9831	0.10	Q	|	|	V
17+35	0.9167	0.24	| Q	| V	|	|	23+30	0.9838	0.10	Q	|	|	V
17+40	0.9184	0.24	| Q	| V	|	|	23+35	0.9844	0.10	Q	|	|	V
17+45	0.9200	0.24	| Q	| V	|	|	23+40	0.9851	0.10	Q	|	|	V
17+50	0.9216	0.23	| Q	| V	|	|	23+45	0.9857	0.10	Q	|	|	V
17+55	0.9230	0.21	| Q	| V	|	|	23+50	0.9864	0.10	Q	|	|	V
18+ 0	0.9244	0.20	| Q	| V	|	|	23+55	0.9870	0.10	Q	|	|	V
18+ 5	0.9257	0.20	| Q	| V	|	|	24+ 0	0.9877	0.10	Q	|	|	V
18+10	0.9271	0.19	| Q	| V	|	|	24+ 5	0.9882	0.08	Q	|	|	V
18+15	0.9284	0.19	| Q	| V	|	|	24+10	0.9884	0.03	Q	|	|	V
18+20	0.9297	0.19	| Q	| V	|	|	24+15	0.9885	0.02	Q	|	|	V
18+25	0.9310	0.19	| Q	| V	|	|	24+20	0.9886	0.01	Q	|	|	V
18+30	0.9324	0.19	| Q	| V	|	|	24+25	0.9886	0.01	Q	|	|	V

24+30	0.9887	0.00	Q	|				v|
24+35	0.9887	0.00	Q	|				v

APPENDIX D.2: 5-YEAR STORM EVENT

1-HOUR STORM DURATION

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
Study date 01/30/18 File: ARAPOST15.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areaal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(Feet.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	0.45	5.17

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.20	13.80

STORM EVENT (YEAR) = 5.00
Area Averaged 2-Year Rainfall = 0.450(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 0.626(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 0.626(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	33.5	0.729	0.681	0.282	1.000	0.282
						Sum (F) = 0.282

Area averaged mean soil loss (F) (In/Hr) = 0.282

Minimum soil loss rate ((In/Hr)) = 0.141
(for 24 hour storm duration)

Soil loss rate (decimal) = 0.355

Slope of intensity-duration curve for a 1 hour storm = 0.5000

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data			
Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)

1	0.083	102.533	19.977	2.315
2	0.167	205.065	48.572	5.629
3	0.250	307.598	15.265	1.769
4	0.333	410.130	6.930	0.803
5	0.417	512.663	3.876	0.449
6	0.500	615.195	2.499	0.290
7	0.583	717.728	1.522	0.176
8	0.667	820.260	1.359	0.158
			Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr.)	Effective (In/Hr)
				Max | Low	
1	0.08	4.20	0.315	(0.282)	0.112 0.203
2	0.17	4.30	0.323	(0.282)	0.115 0.208
3	0.25	5.00	0.375	(0.282)	0.133 0.242
4	0.33	5.00	0.375	(0.282)	0.133 0.242
5	0.42	5.80	0.435	(0.282)	0.155 0.281
6	0.50	6.50	0.488	(0.282)	0.173 0.315
7	0.58	7.40	0.556	(0.282)	0.197 0.358
8	0.67	8.60	0.646	(0.282)	0.229 0.416
9	0.75	12.30	0.923	0.282 (0.328)	0.641
10	0.83	29.10	2.185	0.282 (0.776)	1.903
11	0.92	6.80	0.510	(0.282)	0.181 0.329
12	1.00	5.00	0.375	(0.282)	0.133 0.242
			(Loss Rate Not Used)		
			Sum = 100.0	Sum = 5.4	

Flood volume = Effective rainfall 0.45(In)
times area 11.5(Ac.)/(In)/(Ft.) = 0.4(Ac.Ft)
Total soil loss = 0.18(In)
Total soil loss = 0.170(Ac.Ft)
Total rainfall = 0.63(In)
Flood volume = 18717.4 Cubic Feet
Total soil loss = 7398.4 Cubic Feet

Peak flow rate of this hydrograph = 13.288(CFS)

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1 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h:m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
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0+ 5	0.0032	0.47	Q					
0+10	0.0145	1.63	V Q					
0+15	0.0289	2.09	V Q					
0+20	0.0458	2.46	Q					
0+25	0.0644	2.70	Q					
0+30	0.0856	3.09	QV					
0+35	0.1097	3.50	Q V					
0+40	0.1374	4.01	Q V					
0+45	0.1717	4.99	Q V					
0+50	0.2361	9.35	Q V					
0+55	0.3276	13.29	Q V					
1+ 0	0.3737	6.69	Q V					
1+ 5	0.4012	4.00	Q V					
1+10	0.4140	1.86	Q V					
1+15	0.4214	1.07	Q V					
1+20	0.4258	0.64	Q V					
1+25	0.4288	0.43	Q V					
1+30	0.4294	0.09	Q V					
1+35	0.4297	0.04	Q V					

3-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/30/18 File: ARAPOST35.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areaal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(FT.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	0.80	9.20

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.80	20.70

STORM EVENT (YEAR) = 5.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.800(In)

Point rain (area averaged) = 1.034(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.034(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	33.5	0.729	0.681	0.282	1.000	0.282
					Sum (F)	0.282

Area averaged mean soil loss (F) (In/Hr) = 0.282

Minimum soil loss rate ((In/Hr)) = 0.141
(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.355

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	102.533	19.977	2.315
2	0.167	205.065	48.572	5.629
3	0.250	307.598	15.265	1.769
4	0.333	410.130	6.930	0.803
5	0.417	512.663	3.876	0.449
6	0.500	615.195	2.499	0.290
7	0.583	717.728	1.522	0.176
8	0.667	820.260	1.359	0.158
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate (In/Hr) Max | Low	Effective (In/Hr)
1	0.08	1.30	(0.282) 0.057	0.104
2	0.17	1.30	(0.282) 0.057	0.104
3	0.25	1.10	(0.282) 0.048	0.088
4	0.33	1.50	(0.282) 0.066	0.120
5	0.42	1.50	(0.282) 0.066	0.120
6	0.50	1.80	(0.282) 0.079	0.144
7	0.58	1.50	(0.282) 0.066	0.120
8	0.67	1.80	(0.282) 0.079	0.144
9	0.75	1.80	(0.282) 0.079	0.144
10	0.83	1.50	(0.282) 0.066	0.120
11	0.92	1.60	(0.282) 0.071	0.128
12	1.00	1.80	(0.282) 0.079	0.144
13	1.08	2.20	(0.282) 0.097	0.176
14	1.17	2.20	(0.282) 0.097	0.176
15	1.25	2.20	(0.282) 0.097	0.176
16	1.33	2.00	(0.282) 0.088	0.160
17	1.42	2.60	(0.282) 0.115	0.208
18	1.50	2.70	(0.282) 0.119	0.216
19	1.58	2.40	(0.282) 0.106	0.192
20	1.67	2.70	(0.282) 0.119	0.216
21	1.75	3.30	(0.282) 0.145	0.264
22	1.83	3.10	(0.282) 0.137	0.248
23	1.92	2.90	(0.282) 0.128	0.232
24	2.00	3.00	(0.282) 0.132	0.240
25	2.08	3.10	(0.282) 0.137	0.248
26	2.17	4.20	(0.282) 0.185	0.336
27	2.25	5.00	(0.282) 0.220	0.400
28	2.33	3.50	(0.282) 0.154	0.280
29	2.42	6.80	(0.282) 0.300	0.562
30	2.50	7.30	(0.282) 0.322	0.624
31	2.58	8.20	(0.282) 0.361	0.736
32	2.67	5.90	(0.282) 0.260	0.472
33	2.75	2.00	(0.282) 0.088	0.160
34	2.83	1.80	(0.282) 0.079	0.144

35 2.92 1.80 0.223 (0.282) 0.079 0.144
 36 3.00 0.60 0.074 (0.282) 0.026 0.048
 (Loss Rate Not Used)

Sum =	100.0						Sum = 8.1
Flood volume =	Effective rainfall	0.68 (In)					
times area	$11.5(\text{Ac.}) / [(\text{In.}) / (\text{Ft.})]$	=	0.6 (Ac.Ft)				
Total soil loss =	0.36 (In)						
Total soil loss =	0.341 (Ac.Ft)						
Total rainfall =	1.03 (In)						
Flood volume =	28312.8 Cubic Feet						
Total soil loss =	14858.7 Cubic Feet						

Peak flow rate of this hydrograph = 7.133 (CFS)

3 - H O U R S T O R M

R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h:m)	Volume	Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5		0.0017	0.24 Q					
0+10		0.0074	0.83 V Q					
0+15		0.0141	0.97 V Q					
0+20		0.0212	1.04 |V Q					
0+25		0.0298	1.24 |V Q					
0+30		0.0392	1.37 V Q					
0+35		0.0494	1.49 V Q					
0+40		0.0596	1.48 V Q					
0+45		0.0706	1.59 V Q					
0+50		0.0814	1.58 VQ					
0+55		0.0916	1.48 Q					
1+ 0		0.1021	1.53 Q					
1+ 5		0.1138	1.69 QV					
1+10		0.1269	1.90 Q					
1+15		0.1404	1.97 QV					
1+20		0.1539	1.96 QV					
1+25		0.1677	2.00 Q V					
1+30		0.1833	2.27 Q V					
1+35		0.1995	2.34 Q V					
1+40		0.2154	2.31 Q V					
1+45		0.2329	2.54 Q V					
1+50		0.2523	2.81 Q V					
1+55		0.2715	2.79 Q V					
2+ 0		0.2903	2.74 Q V					
2+ 5		0.3095	2.79 Q V					
2+10		0.3305	3.04 Q V					
2+15		0.3560	3.71 Q V					
2+20		0.3833	3.96 Q V					
2+25		0.4116	4.12 Q V					
2+30		0.4511	5.73 Q V					
2+35		0.4979	6.80 Q V					
2+40		0.5470	7.13 Q V					
2+45		0.5834	5.29 Q V					
2+50		0.6056	3.22 Q V					
2+55		0.6226	2.46 Q V					
3+ 0		0.6358	1.93 Q V					
3+ 5		0.6433	1.08 Q V					
3+10		0.6468	0.51 Q V					
3+15		0.6485	0.25 Q V					
3+20		0.6493	0.11 Q V					
3+25		0.6497	0.06 Q V					
3+30		0.6499	0.03 Q V					
3+35		0.6500	0.01 Q V					

6-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/30/18 File: ARAPOST65.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(FT.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 1.00 11.50

100 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 2.50 28.75

STORM EVENT (YEAR) = 5.00
Area Averaged 2-Year Rainfall = 1.000(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 1.351(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.351(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	33.5	0.729	0.681	0.282	1.000	0.282
					Sum (F)	0.282

Area averaged mean soil loss (F) (In/Hr) = 0.282

Minimum soil loss rate ((In/Hr)) = 0.141
(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.355

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	102.533	19.977	2.315
2	0.167	205.065	48.572	5.629
3	0.250	307.598	15.265	1.769
4	0.333	410.130	6.930	0.803
5	0.417	512.663	3.876	0.449
6	0.500	615.195	2.499	0.290
7	0.583	717.728	1.522	0.176
8	0.667	820.260	1.359	0.158
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate (In./Hr) Max | Low	Effective (In/Hr)
1	0.08	0.50	(0.282) 0.029	0.052
2	0.17	0.60	(0.282) 0.035	0.063
3	0.25	0.60	(0.282) 0.035	0.063
4	0.33	0.60	(0.282) 0.035	0.063
5	0.42	0.60	(0.282) 0.035	0.063
6	0.50	0.70	(0.282) 0.040	0.073
7	0.58	0.70	(0.282) 0.040	0.073
8	0.67	0.70	(0.282) 0.040	0.073
9	0.75	0.70	(0.282) 0.040	0.073
10	0.83	0.70	(0.282) 0.040	0.073
11	0.92	0.70	(0.282) 0.040	0.073
12	1.00	0.80	(0.282) 0.046	0.084
13	1.08	0.80	(0.282) 0.046	0.084
14	1.17	0.80	(0.282) 0.046	0.084
15	1.25	0.80	(0.282) 0.046	0.084
16	1.33	0.80	(0.282) 0.046	0.084
17	1.42	0.80	(0.282) 0.046	0.084
18	1.50	0.80	(0.282) 0.046	0.084
19	1.58	0.80	(0.282) 0.046	0.084
20	1.67	0.80	(0.282) 0.046	0.084
21	1.75	0.80	(0.282) 0.046	0.084
22	1.83	0.80	(0.282) 0.046	0.084
23	1.92	0.80	(0.282) 0.046	0.084
24	2.00	0.90	(0.282) 0.052	0.094
25	2.08	0.80	(0.282) 0.046	0.084
26	2.17	0.90	(0.282) 0.052	0.094
27	2.25	0.90	(0.282) 0.052	0.094
28	2.33	0.90	(0.282) 0.052	0.094
29	2.42	0.90	(0.282) 0.052	0.094
30	2.50	0.90	(0.282) 0.052	0.094
31	2.58	0.90	(0.282) 0.052	0.094
32	2.67	0.90	(0.282) 0.052	0.094
33	2.75	1.00	(0.282) 0.058	0.105
34	2.83	1.00	(0.282) 0.058	0.105

35	2.92	1.00	0.162	(	0.282)	0.058	0.1058
36	3.00	1.00	0.162	(	0.282)	0.058	0.1055
37	3.08	1.00	0.162	(	0.282)	0.058	0.1055
38	3.17	1.10	0.178	(	0.282)	0.063	0.1115
39	3.25	1.10	0.178	(	0.282)	0.063	0.1115
40	3.33	1.10	0.178	(	0.282)	0.063	0.1115
41	3.42	1.20	0.195	(	0.282)	0.069	0.1225
42	3.50	1.30	0.211	(	0.282)	0.075	0.136
43	3.58	1.40	0.227	(	0.282)	0.081	0.146
44	3.67	1.40	0.227	(	0.282)	0.081	0.146
45	3.75	1.50	0.243	(	0.282)	0.086	0.157
46	3.83	1.50	0.243	(	0.282)	0.086	0.157
47	3.92	1.60	0.259	(	0.282)	0.092	0.167
48	4.00	1.60	0.259	(	0.282)	0.092	0.167
49	4.08	1.70	0.276	(	0.282)	0.098	0.178
50	4.17	1.80	0.292	(	0.282)	0.104	0.188
51	4.25	1.90	0.308	(	0.282)	0.109	0.199
52	4.33	2.00	0.324	(	0.282)	0.115	0.209
53	4.42	2.10	0.341	(	0.282)	0.121	0.220
54	4.50	2.10	0.341	(	0.282)	0.121	0.220
55	4.58	2.20	0.357	(	0.282)	0.127	0.230
56	4.67	2.30	0.372	(	0.282)	0.132	0.240
57	4.75	2.40	0.389	(	0.282)	0.138	0.251
58	4.83	2.40	0.389	(	0.282)	0.138	0.251
59	4.92	2.50	0.405	(	0.282)	0.144	0.261
60	5.00	2.60	0.422	(	0.282)	0.150	0.272
61	5.08	3.10	0.503	(	0.282)	0.179	0.324
62	5.17	3.60	0.584	(	0.282)	0.207	0.376
63	5.25	3.90	0.632	(	0.282)	0.225	0.408
64	5.33	4.20	0.681	(	0.282)	0.242	0.439
65	5.42	4.70	0.762	(	0.282)	0.271	0.491
66	5.50	5.60	0.908	(	0.282)	(	0.323)
67	5.58	1.90	0.308	(	0.282)	0.109	0.199
68	5.67	0.90	0.146	(	0.282)	0.052	0.094
69	5.75	0.60	0.097	(	0.282)	0.035	0.063
70	5.83	0.50	0.081	(	0.282)	0.029	0.052
71	5.92	0.30	0.049	(	0.282)	0.017	0.031
72	6.00	0.20	0.032	(	0.282)	0.012	0.021

```

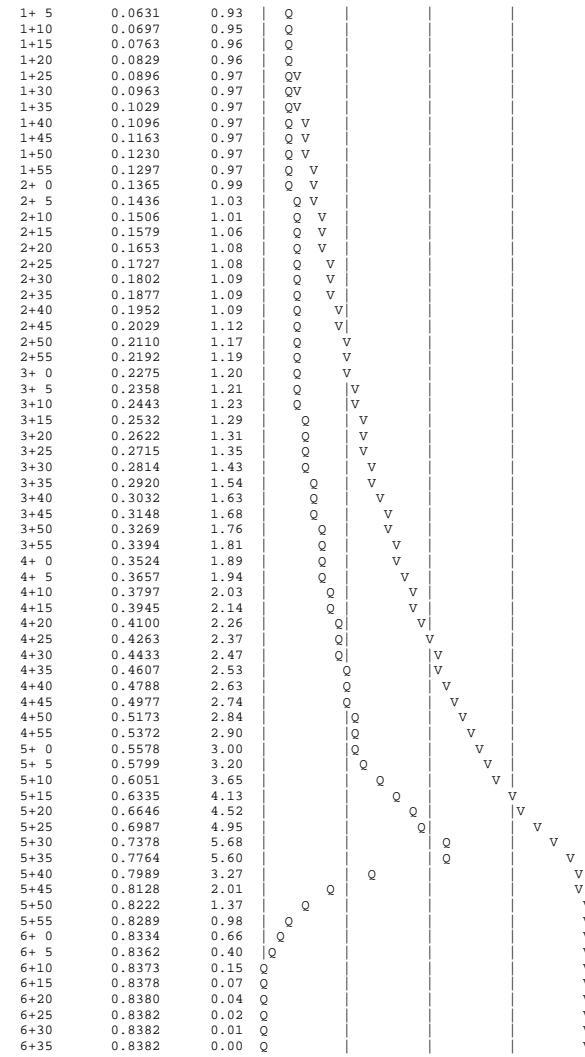
          (Loss Rate Not Used)
Sum =      100.0                                     Sum =      10.5
Flood volume = Effective rainfall      0.87(In)   times area    11.5(Ac.)/[(In)/(Ft.)] = 0.8(Ac.Ft)
Total soil loss =      0.48(In)
Total soil loss =      0.457(Ac.Ft)
Total rainfall =      1.35(In)
Flood volume =      36513.5 Cubic Feet
Total soil loss =      19895.8 Cubic Feet
-----
Peak flow rate of this hydrograph =      5.675(CFS)

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6 - H O U R S T O R M

Runoff Hydrograph

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5		0.0008	0.12	Q				
0+10		0.0039	0.44	VQ				
0+15		0.0079	0.59	V Q				
0+20		0.0124	0.65	V Q				
0+25		0.0171	0.68	V Q				
0+30		0.0221	0.73	|VQ				
0+35		0.0276	0.80	|V Q				
0+40		0.0333	0.83	|V Q				
0+45		0.0391	0.84	|V Q				
0+50		0.0449	0.84	|VQ				
0+55		0.0507	0.85	VQ				
1+ 0		0.0567	0.87	VQ				



24-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/30/18 File: ARAPOST245.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(FT.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 1.60 18.40

100 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 4.10 47.15

STORM EVENT (YEAR) = 5.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.100(In)

Point rain (area averaged) = 2.186(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.186(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	33.5	0.729	0.681	0.282	1.000	0.282
					Sum (F)	0.282

Area averaged mean soil loss (F) (In/Hr) = 0.282

Minimum soil loss rate ((In/Hr)) = 0.141
(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.355

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	102.533	19.977	2.315
2	0.167	205.065	48.572	5.629
3	0.250	307.598	15.265	1.769
4	0.333	410.130	6.930	0.803
5	0.417	512.663	3.876	0.449
6	0.500	615.195	2.499	0.290
7	0.583	717.728	1.522	0.176
8	0.667	820.260	1.359	0.158
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate (In./Hr) Max | Low	Effective (In/Hr)
1	0.08	0.07	(0.500) 0.006	0.011
2	0.17	0.07	(0.498) 0.006	0.011
3	0.25	0.07	(0.496) 0.006	0.011
4	0.33	0.10	(0.494) 0.009	0.017
5	0.42	0.10	(0.492) 0.009	0.017
6	0.50	0.10	(0.490) 0.009	0.017
7	0.58	0.10	(0.488) 0.009	0.017
8	0.67	0.10	(0.487) 0.009	0.017
9	0.75	0.10	(0.485) 0.009	0.017
10	0.83	0.13	(0.483) 0.012	0.023
11	0.92	0.13	(0.481) 0.012	0.023
12	1.00	0.13	(0.479) 0.012	0.023
13	1.08	0.10	(0.477) 0.009	0.017
14	1.17	0.10	(0.475) 0.009	0.017
15	1.25	0.10	(0.473) 0.009	0.017
16	1.33	0.10	(0.471) 0.009	0.017
17	1.42	0.10	(0.470) 0.009	0.017
18	1.50	0.10	(0.468) 0.009	0.017
19	1.58	0.10	(0.466) 0.009	0.017
20	1.67	0.10	(0.464) 0.009	0.017
21	1.75	0.10	(0.462) 0.009	0.017
22	1.83	0.13	(0.460) 0.012	0.023
23	1.92	0.13	(0.458) 0.012	0.023
24	2.00	0.13	(0.457) 0.012	0.023
25	2.08	0.13	(0.455) 0.012	0.023
26	2.17	0.13	(0.453) 0.012	0.023
27	2.25	0.13	(0.451) 0.012	0.023
28	2.33	0.13	(0.449) 0.012	0.023
29	2.42	0.13	(0.447) 0.012	0.023
30	2.50	0.13	(0.445) 0.012	0.023
31	2.58	0.17	(0.444) 0.016	0.028
32	2.67	0.17	(0.442) 0.016	0.028
33	2.75	0.17	(0.440) 0.016	0.028
34	2.83	0.17	(0.438) 0.016	0.028

35	2.92	0.17	0.044	(0.436)	0.016	0.028		106	8.83	0.57	0.149	(0.319)	0.053	0.096
36	3.00	0.17	0.044	(0.435)	0.016	0.028		107	8.92	0.57	0.149	(0.317)	0.053	0.096
37	3.08	0.17	0.044	(0.433)	0.016	0.028		108	9.00	0.57	0.149	(0.316)	0.053	0.096
38	3.17	0.17	0.044	(0.431)	0.016	0.028		109	9.08	0.63	0.166	(0.314)	0.059	0.107
39	3.25	0.17	0.044	(0.429)	0.016	0.028		110	9.17	0.63	0.166	(0.313)	0.059	0.107
40	3.33	0.17	0.044	(0.427)	0.016	0.028		111	9.25	0.63	0.166	(0.311)	0.059	0.107
41	3.42	0.17	0.044	(0.426)	0.016	0.028		112	9.33	0.67	0.175	(0.310)	0.062	0.113
42	3.50	0.17	0.044	(0.424)	0.016	0.028		113	9.42	0.67	0.175	(0.308)	0.062	0.113
43	3.58	0.17	0.044	(0.422)	0.016	0.028		114	9.50	0.67	0.175	(0.307)	0.062	0.113
44	3.67	0.17	0.044	(0.420)	0.016	0.028		115	9.58	0.70	0.184	(0.305)	0.065	0.118
45	3.75	0.17	0.044	(0.419)	0.016	0.028		116	9.67	0.70	0.184	(0.304)	0.065	0.118
46	3.83	0.20	0.052	(0.417)	0.019	0.034		117	9.75	0.70	0.184	(0.302)	0.065	0.118
47	3.92	0.20	0.052	(0.415)	0.019	0.034		118	9.83	0.73	0.192	(0.301)	0.068	0.124
48	4.00	0.20	0.052	(0.413)	0.019	0.034		119	9.92	0.73	0.192	(0.299)	0.068	0.124
49	4.08	0.20	0.052	(0.412)	0.019	0.034		120	10.00	0.73	0.192	(0.298)	0.068	0.124
50	4.17	0.20	0.052	(0.410)	0.019	0.034		121	10.08	0.50	0.131	(0.296)	0.047	0.085
51	4.25	0.20	0.052	(0.408)	0.019	0.034		122	10.17	0.50	0.131	(0.295)	0.047	0.085
52	4.33	0.23	0.061	(0.406)	0.022	0.039		123	10.25	0.50	0.131	(0.294)	0.047	0.085
53	4.42	0.23	0.061	(0.405)	0.022	0.039		124	10.33	0.50	0.131	(0.292)	0.047	0.085
54	4.50	0.23	0.061	(0.403)	0.022	0.039		125	10.42	0.50	0.131	(0.291)	0.047	0.085
55	4.58	0.23	0.061	(0.401)	0.022	0.039		126	10.50	0.50	0.131	(0.289)	0.047	0.085
56	4.67	0.23	0.061	(0.399)	0.022	0.039		127	10.58	0.67	0.175	(0.288)	0.062	0.113
57	4.75	0.23	0.061	(0.398)	0.022	0.039		128	10.67	0.67	0.175	(0.286)	0.062	0.113
58	4.83	0.27	0.070	(0.396)	0.025	0.045		129	10.75	0.67	0.175	(0.285)	0.062	0.113
59	4.92	0.27	0.070	(0.394)	0.025	0.045		130	10.83	0.67	0.175	(0.284)	0.062	0.113
60	5.00	0.27	0.070	(0.393)	0.025	0.045		131	10.92	0.67	0.175	(0.282)	0.062	0.113
61	5.08	0.20	0.052	(0.391)	0.019	0.034		132	11.00	0.67	0.175	(0.281)	0.062	0.113
62	5.17	0.20	0.052	(0.389)	0.019	0.034		133	11.08	0.63	0.166	(0.280)	0.059	0.107
63	5.25	0.20	0.052	(0.387)	0.019	0.034		134	11.17	0.63	0.166	(0.278)	0.059	0.107
64	5.33	0.23	0.061	(0.386)	0.022	0.039		135	11.25	0.63	0.166	(0.277)	0.059	0.107
65	5.42	0.23	0.061	(0.384)	0.022	0.039		136	11.33	0.63	0.166	(0.275)	0.059	0.107
66	5.50	0.23	0.061	(0.382)	0.022	0.039		137	11.42	0.63	0.166	(0.274)	0.059	0.107
67	5.58	0.27	0.070	(0.381)	0.025	0.045		138	11.50	0.63	0.166	(0.273)	0.059	0.107
68	5.67	0.27	0.070	(0.379)	0.025	0.045		139	11.58	0.57	0.149	(0.271)	0.053	0.096
69	5.75	0.27	0.070	(0.377)	0.025	0.045		140	11.67	0.57	0.149	(0.270)	0.053	0.096
70	5.83	0.27	0.070	(0.376)	0.025	0.045		141	11.75	0.57	0.149	(0.269)	0.053	0.096
71	5.92	0.27	0.070	(0.374)	0.025	0.045		142	11.83	0.60	0.157	(0.267)	0.056	0.101
72	6.00	0.27	0.070	(0.372)	0.025	0.045		143	11.92	0.60	0.157	(0.266)	0.056	0.101
73	6.08	0.30	0.079	(0.371)	0.028	0.051		144	12.00	0.60	0.157	(0.265)	0.056	0.101
74	6.17	0.30	0.079	(0.369)	0.028	0.051		145	12.08	0.83	0.219	(0.263)	0.078	0.141
75	6.25	0.30	0.079	(0.367)	0.028	0.051		146	12.17	0.83	0.219	(0.262)	0.078	0.141
76	6.33	0.30	0.079	(0.366)	0.028	0.051		147	12.25	0.83	0.219	(0.261)	0.078	0.141
77	6.42	0.30	0.079	(0.364)	0.028	0.051		148	12.33	0.87	0.227	(0.259)	0.081	0.147
78	6.50	0.30	0.079	(0.362)	0.028	0.051		149	12.42	0.87	0.227	(0.258)	0.081	0.147
79	6.58	0.33	0.087	(0.361)	0.031	0.056		150	12.50	0.87	0.227	(0.257)	0.081	0.147
80	6.67	0.33	0.087	(0.359)	0.031	0.056		151	12.58	0.93	0.245	(0.255)	0.087	0.158
81	6.75	0.33	0.087	(0.358)	0.031	0.056		152	12.67	0.93	0.245	(0.254)	0.087	0.158
82	6.83	0.33	0.087	(0.356)	0.031	0.056		153	12.75	0.93	0.245	(0.253)	0.087	0.158
83	6.92	0.33	0.087	(0.354)	0.031	0.056		154	12.83	0.97	0.254	(0.252)	0.090	0.163
84	7.00	0.33	0.087	(0.353)	0.031	0.056		155	12.92	0.97	0.254	(0.250)	0.090	0.163
85	7.08	0.33	0.087	(0.351)	0.031	0.056		156	13.00	0.97	0.254	(0.249)	0.090	0.163
86	7.17	0.33	0.087	(0.350)	0.031	0.056		157	13.08	1.13	0.297	(0.248)	0.106	0.192
87	7.25	0.33	0.087	(0.348)	0.031	0.056		158	13.17	1.13	0.297	(0.247)	0.106	0.192
88	7.33	0.37	0.096	(0.346)	0.034	0.062		159	13.25	1.13	0.297	(0.245)	0.106	0.192
89	7.42	0.37	0.096	(0.345)	0.034	0.062		160	13.33	1.13	0.297	(0.244)	0.106	0.192
90	7.50	0.37	0.096	(0.343)	0.034	0.062		161	13.42	1.13	0.297	(0.243)	0.106	0.192
91	7.58	0.40	0.105	(0.342)	0.037	0.068		162	13.50	1.13	0.297	(0.242)	0.106	0.192
92	7.67	0.40	0.105	(0.340)	0.037	0.068		163	13.58	0.77	0.201	(0.240)	0.071	0.130
93	7.75	0.40	0.105	(0.338)	0.037	0.068		164	13.67	0.77	0.201	(0.239)	0.071	0.130
94	7.83	0.43	0.114	(0.337)	0.040	0.073		165	13.75	0.77	0.201	(0.238)	0.071	0.130
95	7.92	0.43	0.114	(0.335)	0.040	0.073		166	13.83	0.77	0.201	(0.237)	0.071	0.130
96	8.00	0.43	0.114	(0.334)	0.040	0.073		167	13.92	0.77	0.201	(0.236)	0.071	0.130
97	8.08	0.50	0.131	(0.332)	0.047	0.085		168	14.00	0.77	0.201	(0.234)	0.071	0.130
98	8.17	0.50	0.131	(0.331)	0.047	0.085		169	14.08	0.90	0.236	(0.233)	0.084	0.152
99	8.25	0.50	0.131	(0.329)	0.047	0.085		170	14.17	0.90	0.236	(0.232)	0.084	0.152
100	8.33	0.50	0.131	(0.328)	0.047	0.085		171	14.25	0.90	0.236	(0.231)	0.084	0.152
101	8.42	0.50	0.131	(0.326)	0.047	0.085		172	14.33	0.87	0.227	(0.230)	0.081	0.147
102	8.50	0.50	0.131	(0.325)	0.047	0.085		173	14.42	0.87	0.227	(0.228)	0.081	0.147
103	8.58	0.53	0.140	(0.323)	0.050	0.090		174	14.50	0.87	0.227	(0.227)	0.081	0.147
104	8.67	0.53	0.140	(0.322)	0.050	0.090		175	14.58	0.87	0.227	(0.226)	0.081	0.147
105	8.75	0.53	0.140	(0.320)	0.050	0.090		176	14.67	0.87	0.227	(0.225)	0.081	0.147

177	14.75	0.87	0.227	(0.224)	0.081	0.147		248	20.67	0.10	0.026	(0.158)	0.009	0.017
178	14.83	0.83	0.219	(0.223)	0.078	0.141		249	20.75	0.10	0.026	(0.158)	0.009	0.017
179	14.92	0.83	0.219	(0.221)	0.078	0.141		250	20.83	0.07	0.017	(0.157)	0.006	0.011
180	15.00	0.83	0.219	(0.220)	0.078	0.141		251	20.92	0.07	0.017	(0.156)	0.006	0.011
181	15.08	0.80	0.210	(0.219)	0.075	0.135		252	21.00	0.07	0.017	(0.156)	0.006	0.011
182	15.17	0.80	0.210	(0.218)	0.075	0.135		253	21.08	0.10	0.026	(0.155)	0.009	0.017
183	15.25	0.80	0.210	(0.217)	0.075	0.135		254	21.17	0.10	0.026	(0.154)	0.009	0.017
184	15.33	0.77	0.201	(0.216)	0.071	0.130		255	21.25	0.10	0.026	(0.154)	0.009	0.017
185	15.42	0.77	0.201	(0.215)	0.071	0.130		256	21.33	0.07	0.017	(0.153)	0.006	0.011
186	15.50	0.77	0.201	(0.214)	0.071	0.130		257	21.42	0.07	0.017	(0.153)	0.006	0.011
187	15.58	0.63	0.166	(0.213)	0.059	0.107		258	21.50	0.07	0.017	(0.152)	0.006	0.011
188	15.67	0.63	0.166	(0.211)	0.059	0.107		259	21.58	0.10	0.026	(0.152)	0.009	0.017
189	15.75	0.63	0.166	(0.210)	0.059	0.107		260	21.67	0.10	0.026	(0.151)	0.009	0.017
190	15.83	0.63	0.166	(0.209)	0.059	0.107		261	21.75	0.10	0.026	(0.150)	0.009	0.017
191	15.92	0.63	0.166	(0.208)	0.059	0.107		262	21.83	0.07	0.017	(0.150)	0.006	0.011
192	16.00	0.63	0.166	(0.207)	0.059	0.107		263	21.92	0.07	0.017	(0.149)	0.006	0.011
193	16.08	0.13	0.035	(0.206)	0.012	0.023		264	22.00	0.07	0.017	(0.149)	0.006	0.011
194	16.17	0.13	0.035	(0.205)	0.012	0.023		265	22.08	0.10	0.026	(0.148)	0.009	0.017
195	16.25	0.13	0.035	(0.204)	0.012	0.023		266	22.17	0.10	0.026	(0.148)	0.009	0.017
196	16.33	0.13	0.035	(0.203)	0.012	0.023		267	22.25	0.10	0.026	(0.147)	0.009	0.017
197	16.42	0.13	0.035	(0.202)	0.012	0.023		268	22.33	0.07	0.017	(0.147)	0.006	0.011
198	16.50	0.13	0.035	(0.201)	0.012	0.023		269	22.42	0.07	0.017	(0.147)	0.006	0.011
199	16.58	0.10	0.026	(0.200)	0.009	0.017		270	22.50	0.07	0.017	(0.146)	0.006	0.011
200	16.67	0.10	0.026	(0.199)	0.009	0.017		271	22.58	0.07	0.017	(0.146)	0.006	0.011
201	16.75	0.10	0.026	(0.198)	0.009	0.017		272	22.67	0.07	0.017	(0.145)	0.006	0.011
202	16.83	0.10	0.026	(0.197)	0.009	0.017		273	22.75	0.07	0.017	(0.145)	0.006	0.011
203	16.92	0.10	0.026	(0.196)	0.009	0.017		274	22.83	0.07	0.017	(0.145)	0.006	0.011
204	17.00	0.10	0.026	(0.195)	0.009	0.017		275	22.92	0.07	0.017	(0.144)	0.006	0.011
205	17.08	0.17	0.044	(0.194)	0.016	0.028		276	23.00	0.07	0.017	(0.144)	0.006	0.011
206	17.17	0.17	0.044	(0.193)	0.016	0.028		277	23.08	0.07	0.017	(0.143)	0.006	0.011
207	17.25	0.17	0.044	(0.192)	0.016	0.028		278	23.17	0.07	0.017	(0.143)	0.006	0.011
208	17.33	0.17	0.044	(0.191)	0.016	0.028		279	23.25	0.07	0.017	(0.143)	0.006	0.011
209	17.42	0.17	0.044	(0.190)	0.016	0.028		280	23.33	0.07	0.017	(0.143)	0.006	0.011
210	17.50	0.17	0.044	(0.189)	0.016	0.028		281	23.42	0.07	0.017	(0.142)	0.006	0.011
211	17.58	0.17	0.044	(0.188)	0.016	0.028		282	23.50	0.07	0.017	(0.142)	0.006	0.011
212	17.67	0.17	0.044	(0.187)	0.016	0.028		283	23.58	0.07	0.017	(0.142)	0.006	0.011
213	17.75	0.17	0.044	(0.186)	0.016	0.028		284	23.67	0.07	0.017	(0.142)	0.006	0.011
214	17.83	0.13	0.035	(0.185)	0.012	0.023		285	23.75	0.07	0.017	(0.141)	0.006	0.011
215	17.92	0.13	0.035	(0.184)	0.012	0.023		286	23.83	0.07	0.017	(0.141)	0.006	0.011
216	18.00	0.13	0.035	(0.183)	0.012	0.023		287	23.92	0.07	0.017	(0.141)	0.006	0.011
217	18.08	0.13	0.035	(0.183)	0.012	0.023		288	24.00	0.07	0.017	(0.141)	0.006	0.011
218	18.17	0.13	0.035	(0.182)	0.012	0.023								
219	18.25	0.13	0.035	(0.181)	0.012	0.023								
220	18.33	0.13	0.035	(0.180)	0.012	0.023								
221	18.42	0.13	0.035	(0.179)	0.012	0.023								
222	18.50	0.13	0.035	(0.178)	0.012	0.023								
223	18.58	0.10	0.026	(0.177)	0.009	0.017								
224	18.67	0.10	0.026	(0.176)	0.009	0.017								
225	18.75	0.10	0.026	(0.176)	0.009	0.017								
226	18.83	0.07	0.017	(0.175)	0.006	0.011								
227	18.92	0.07	0.017	(0.174)	0.006	0.011								
228	19.00	0.07	0.017	(0.173)	0.006	0.011								
229	19.08	0.10	0.026	(0.172)	0.009	0.017								
230	19.17	0.10	0.026	(0.171)	0.009	0.017								
231	19.25	0.10	0.026	(0.171)	0.009	0.017								
232	19.33	0.13	0.035	(0.170)	0.012	0.023								
233	19.42	0.13	0.035	(0.169)	0.012	0.023								
234	19.50	0.13	0.035	(0.168)	0.012	0.023								
235	19.58	0.10	0.026	(0.168)	0.009	0.017								
236	19.67	0.10	0.026	(0.167)	0.009	0.017								
237	19.75	0.10	0.026	(0.166)	0.009	0.017								
238	19.83	0.07	0.017	(0.165)	0.006	0.011								
239	19.92	0.07	0.017	(0.165)	0.006	0.011								
240	20.00	0.07	0.017	(0.164)	0.006	0.011								
241	20.08	0.10	0.026	(0.163)	0.009	0.017								
242	20.17	0.10	0.026	(0.162)	0.009	0.017								
243	20.25	0.10	0.026	(0.162)	0.009	0.017								
244	20.33	0.10	0.026	(0.161)	0.009	0.017								
245	20.42	0.10	0.026	(0.160)	0.009	0.017								
246	20.50	0.10	0.026	(0.160)	0.009	0.017								
247	20.58	0.10	0.026	(0.159)	0.009	0.017								

(Loss Rate Not Used)

Sum = 100.0 Sum = 16.9

Flood volume = Effective rainfall 1.41(In)
times area 11.5(Ac.)/(In)/(Ft.)] = 1.4(Ac.Ft)

Total soil loss = 0.78(In)
Total soil loss = 0.744(Ac.Ft)
Total rainfall = 2.19(In)
Flood volume = 58827.8 Cubic Feet
Total soil loss = 32406.4 Cubic Feet

Peak flow rate of this hydrograph = 2.213(CFS)

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24 - H O U R S T O R M
Runoff Hydrograph

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0002		0.03 Q					
0+10	0.0008		0.09 Q					
0+15	0.0016		0.11 Q					
0+20	0.0025		0.13 Q					
0+25	0.0036		0.17 Q					
0+30	0.0049		0.18 Q					
0+35	0.0062		0.19 Q					
0+40	0.0075		0.19 Q					
0+45	0.0088		0.19 Q					

12+40	0.7417	1.79	Q		V				18+35	1.2753	0.25	Q
12+45	0.7542	1.81	Q		V				18+40	1.2768	0.22	Q
12+50	0.7668	1.83	Q		V				18+45	1.2782	0.21	Q
12+55	0.7797	1.87	Q		V				18+50	1.2795	0.19	Q
13+ 0	0.7926	1.88	Q		V				18+55	1.2806	0.15	Q
13+ 5	0.8061	1.95	Q		V				19+ 0	1.2816	0.14	Q
13+10	0.8206	2.12	Q		V				19+ 5	1.2826	0.15	Q
13+15	0.8356	2.17	Q		V				19+10	1.2838	0.18	Q
13+20	0.8507	2.19	Q		V				19+15	1.2851	0.19	Q
13+25	0.8658	2.20	Q		V				19+20	1.2865	0.20	Q
13+30	0.8811	2.21	Q		V				19+25	1.2882	0.24	Q
13+35	0.8954	2.07	Q		V				19+30	1.2899	0.25	Q
13+40	0.9073	1.73	Q		V				19+35	1.2915	0.24	Q
13+45	0.9184	1.62	Q		V				19+40	1.2930	0.21	Q
13+50	0.9293	1.57	Q		V				19+45	1.2944	0.20	Q
13+55	0.9399	1.54	Q		V				19+50	1.2957	0.19	Q
14+ 0	0.9504	1.52	Q		V				19+55	1.2968	0.15	Q
14+ 5	0.9611	1.57	Q		V				20+ 0	1.2978	0.14	Q
14+10	0.9727	1.68	Q		V				20+ 5	1.2988	0.15	Q
14+15	0.9846	1.72	Q		V				20+10	1.3000	0.18	Q
14+20	0.9965	1.73	Q		V				20+15	1.3013	0.19	Q
14+25	1.0082	1.71	Q		V				20+20	1.3026	0.19	Q
14+30	1.0200	1.70	Q		V				20+25	1.3040	0.19	Q
14+35	1.0317	1.70	Q		V				20+30	1.3053	0.19	Q
14+40	1.0434	1.70	Q		V				20+35	1.3067	0.20	Q
14+45	1.0551	1.70	Q		V				20+40	1.3080	0.20	Q
14+50	1.0668	1.69	Q		V				20+45	1.3094	0.20	Q
14+55	1.0782	1.65	Q		V				20+50	1.3106	0.18	Q
15+ 0	1.0895	1.64	Q		V				20+55	1.3117	0.15	Q
15+ 5	1.1007	1.63	Q		V				21+ 0	1.3126	0.14	Q
15+10	1.1117	1.59	Q		V				21+ 5	1.3137	0.15	Q
15+15	1.1225	1.58	Q		V				21+10	1.3149	0.18	Q
15+20	1.1333	1.56	Q		V				21+15	1.3162	0.19	Q
15+25	1.1438	1.53	Q		V				21+20	1.3174	0.18	Q
15+30	1.1543	1.52	Q		V				21+25	1.3184	0.15	Q
15+35	1.1643	1.46	Q		V				21+30	1.3194	0.14	Q
15+40	1.1735	1.33	Q		V				21+35	1.3204	0.15	Q
15+45	1.1823	1.29	Q		V				21+40	1.3217	0.18	Q
15+50	1.1910	1.27	Q		V				21+45	1.3229	0.19	Q
15+55	1.1997	1.26	Q		V				21+50	1.3242	0.18	Q
16+ 0	1.2083	1.25	Q		V				21+55	1.3252	0.15	Q
16+ 5	1.2155	1.05	Q		V				22+ 0	1.3261	0.14	Q
16+10	1.2194	0.57	Q		V				22+ 5	1.3272	0.15	Q
16+15	1.2223	0.42	Q		V				22+10	1.3284	0.18	Q
16+20	1.2248	0.35	Q		V				22+15	1.3297	0.19	Q
16+25	1.2269	0.31	Q		V				22+20	1.3309	0.18	Q
16+30	1.2289	0.29	Q		V				22+25	1.3319	0.15	Q
16+35	1.2307	0.26	Q		V				22+30	1.3329	0.14	Q
16+40	1.2322	0.22	Q		V				22+35	1.3338	0.14	Q
16+45	1.2336	0.21	Q		V				22+40	1.3348	0.13	Q
16+50	1.2350	0.20	Q		V				22+45	1.3357	0.13	Q
16+55	1.2364	0.20	Q		V				22+50	1.3366	0.13	Q
17+ 0	1.2378	0.20	Q		V				22+55	1.3375	0.13	Q
17+ 5	1.2393	0.22	Q		V				23+ 0	1.3384	0.13	Q
17+10	1.2413	0.29	Q		V				23+ 5	1.3393	0.13	Q
17+15	1.2434	0.31	Q		V				23+10	1.3402	0.13	Q
17+20	1.2456	0.31	Q		V				23+15	1.3411	0.13	Q
17+25	1.2478	0.32	Q		V				23+20	1.3420	0.13	Q
17+30	1.2500	0.32	Q		V				23+25	1.3429	0.13	Q
17+35	1.2522	0.33	Q		V				23+30	1.3438	0.13	Q
17+40	1.2545	0.33	Q		V				23+35	1.3447	0.13	Q
17+45	1.2567	0.33	Q		V				23+40	1.3456	0.13	Q
17+50	1.2589	0.31	Q		V				23+45	1.3465	0.13	Q
17+55	1.2608	0.28	Q		V				23+50	1.3474	0.13	Q
18+ 0	1.2627	0.27	Q		V				23+55	1.3483	0.13	Q
18+ 5	1.2645	0.27	Q		V				24+ 0	1.3492	0.13	Q
18+10	1.2664	0.26	Q		V				24+ 5	1.3499	0.10	Q
18+15	1.2682	0.26	Q		V				24+10	1.3502	0.04	Q
18+20	1.2700	0.26	Q		V				24+15	1.3503	0.02	Q
18+25	1.2718	0.26	Q		V				24+20	1.3504	0.01	Q
18+30	1.2736	0.26	Q		V				24+25	1.3505	0.01	Q

24+30	1.3505	0.00	Q	|		|		v|
24+35	1.3505	0.00	Q	|		|		v|

APPENDIX D.3: 10-YEAR STORM EVENT

1-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPOST110.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areaal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(Feet.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	0.45	5.17

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.20	13.80

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 0.450(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 0.759(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 0.758(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	53.1	0.540	0.681	0.209	1.000	0.209
						Sum (F) = 0.209

Area averaged mean soil loss (F) (In/Hr) = 0.209

Minimum soil loss rate ((In/Hr)) = 0.105
(for 24 hour storm duration)

Soil loss rate (decimal) = 0.355

Slope of intensity-duration curve for a 1 hour storm = 0.5000

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period Time % of lag Distribution Unit Hydrograph
(hrs) Graph % (CFS)

1	0.083	102.533	19.977	2.315
2	0.167	205.065	48.572	5.629
3	0.250	307.598	15.265	1.769
4	0.333	410.130	6.930	0.803
5	0.417	512.663	3.876	0.449
6	0.500	615.195	2.499	0.290
7	0.583	717.728	1.522	0.176
8	0.667	820.260	1.359	0.158
			Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time	Pattern	Storm Rain	Loss rate(In./Hr.)	Effective
(Hr.)	Percent	(In/Hr)	Max | Low	(In/Hr)	
1	0.08	4.20	0.382	(0.209)	0.136 0.246
2	0.17	4.30	0.391	(0.209)	0.139 0.252
3	0.25	5.00	0.455	(0.209)	0.162 0.293
4	0.33	5.00	0.455	(0.209)	0.162 0.293
5	0.42	5.80	0.528	(0.209)	0.188 0.340
6	0.50	6.50	0.592	0.209 (0.210)	0.382
7	0.58	7.40	0.674	0.209 (0.239)	0.464
8	0.67	8.60	0.783	0.209 (0.278)	0.574
9	0.75	12.30	1.120	0.209 (0.398)	0.910
10	0.83	29.10	2.649	0.209 (0.941)	2.439
11	0.92	6.80	0.619	0.209 (0.220)	0.410
12	1.00	5.00	0.455	(0.209)	0.162 0.293
			(Loss Rate Not Used)		
			Sum = 100.0		Sum = 6.9

Flood volume = Effective rainfall 0.57(In)
times area 11.5(Ac.)/(In)/(Ft.) = 0.6(Ac.Ft)
Total soil loss = 0.18(In)
Total soil loss = 0.176(Ac.Ft)
Total rainfall = 0.76(In)
Flood volume = 24001.2 Cubic Feet
Total soil loss = 7661.4 Cubic Feet

Peak flow rate of this hydrograph = 17.187(CFS)

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1 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h:m) Volume Ac.Ft Q(CFS) 0 5.0 10.0 15.0 20.0

0+ 5	0.0039	0.57	VQ					
0+10	0.0175	1.97	V Q					
0+15	0.0350	2.54	V Q					
0+20	0.0555	2.98	VQ					
0+25	0.0781	3.27	VQ					
0+30	0.1038	3.74	Q					
0+35	0.1336	4.32	QV					
0+40	0.1693	5.19	Q V					
0+45	0.2162	6.80	Q V					
0+50	0.3025	12.54	V Q					
0+55	0.4209	17.19	V V					
1+ 0	0.4797	8.55	Q					
1+ 5	0.5146	5.06	Q				V	
1+10	0.5310	2.38	Q				V	
1+15	0.5405	1.38	Q				V	
1+20	0.5461	0.82	Q				V	
1+25	0.5499	0.54	Q				V	
1+30	0.5507	0.12	Q				V	
1+35	0.5510	0.05	Q				V	

3-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPOST310.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areaal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(FT.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	0.80	9.20

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.80	20.70

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.800(In)

Point rain (area averaged) = 1.211(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.211(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	53.1	0.540	0.681	0.209	1.000	0.209
					Sum (F)	0.209

Area averaged mean soil loss (F) (In/Hr) = 0.209

Minimum soil loss rate ((In/Hr)) = 0.105
(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.355

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	102.533	19.977
2	0.167	205.065	48.572
3	0.250	307.598	15.265
4	0.333	410.130	6.930
5	0.417	512.663	3.876
6	0.500	615.195	2.499
7	0.583	717.728	1.522
8	0.667	820.260	1.359
		Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate (In./Hr) Max | Low	Effective (In/Hr)
1	0.08	1.30	(0.209) 0.067	0.122
2	0.17	1.30	(0.209) 0.067	0.122
3	0.25	1.10	(0.209) 0.057	0.103
4	0.33	1.50	(0.209) 0.077	0.141
5	0.42	1.50	(0.209) 0.077	0.141
6	0.50	1.80	(0.209) 0.093	0.169
7	0.58	1.50	(0.209) 0.077	0.141
8	0.67	1.80	(0.209) 0.093	0.169
9	0.75	1.80	(0.209) 0.093	0.169
10	0.83	1.50	(0.209) 0.077	0.141
11	0.92	1.60	(0.209) 0.083	0.150
12	1.00	1.80	(0.209) 0.093	0.169
13	1.08	2.20	(0.209) 0.114	0.206
14	1.17	2.20	(0.209) 0.114	0.206
15	1.25	2.20	(0.209) 0.114	0.206
16	1.33	2.00	(0.209) 0.103	0.187
17	1.42	2.60	(0.209) 0.134	0.244
18	1.50	2.70	(0.209) 0.139	0.253
19	1.58	2.40	(0.209) 0.124	0.225
20	1.67	2.70	(0.209) 0.139	0.253
21	1.75	3.30	(0.209) 0.170	0.309
22	1.83	3.10	(0.209) 0.160	0.291
23	1.92	2.90	(0.209) 0.150	0.272
24	2.00	3.00	(0.209) 0.155	0.281
25	2.08	3.10	(0.209) 0.160	0.291
26	2.17	4.20	(0.209) 0.209 (0.217) 0.401	
27	2.25	5.00	(0.209) 0.209 (0.258) 0.518	
28	2.33	3.50	(0.209) 0.181	0.328
29	2.42	6.80	(0.209) 0.351 (0.377) 0.779	
30	2.50	7.30	(0.209) 0.377	0.852
31	2.58	8.20	(0.209) 0.423	0.983
32	2.67	5.90	(0.209) 0.305	0.648
33	2.75	2.00	(0.209) 0.103	0.187
34	2.83	1.80	(0.209) 0.093	0.169

35	2.92	1.80	0.262	(0.209)	0.093	0.169
36	3.00	0.60	0.087	(0.209)	0.031	0.056

(Loss Rate Not Used)

Sum = 100.0 Sum = 10.0

Flood volume = Effective rainfall 0.84(In)

times area 11.5(Ac.)/(In)/(Ft.)] = 0.8(Ac.Ft)

Total soil loss = 0.37(In)

Total soil loss = 0.358(Ac.Ft)

Total rainfall = 1.21(In)

Flood volume = 34957.6 Cubic Feet

Total soil loss = 15610.1 Cubic Feet

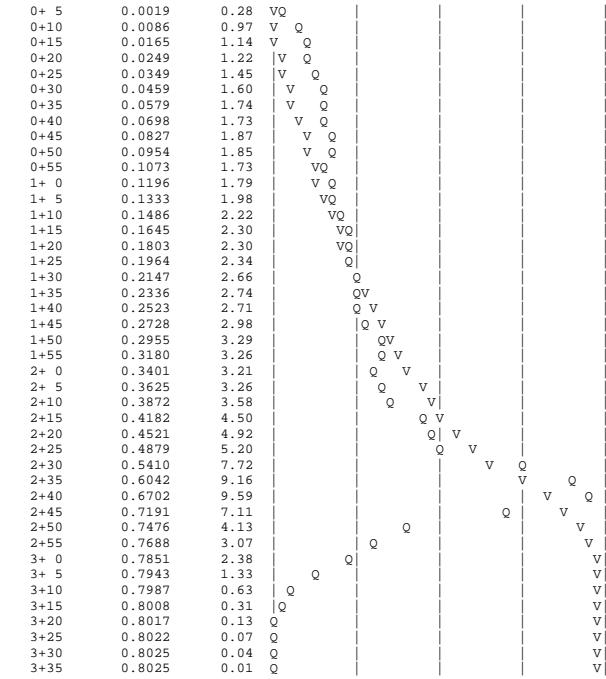
Peak flow rate of this hydrograph = 9.586(CFS)

3 - H O U R S T O R M

R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h:m) Volume Ac.Ft Q(CFS) 0 2.5 5.0 7.5 10.0



6-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPOST610.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(FT.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.00	11.50

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	2.50	28.75

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 1.000(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 1.617(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.617(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	53.1	0.540	0.681	0.209	1.000	0.209
					Sum (F)	0.209

Area averaged mean soil loss (F) (In/Hr) = 0.209

Minimum soil loss rate ((In/Hr)) = 0.105
(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.355

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	102.533	19.977	2.315
2	0.167	205.065	48.572	5.629
3	0.250	307.598	15.265	1.769
4	0.333	410.130	6.930	0.803
5	0.417	512.663	3.876	0.449
6	0.500	615.195	2.499	0.290
7	0.583	717.728	1.522	0.176
8	0.667	820.260	1.359	0.158
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate (In./Hr) Max | Low	Effective (In/Hr)
1	0.08	0.50	(0.209) 0.034	0.063
2	0.17	0.60	(0.209) 0.041	0.075
3	0.25	0.60	(0.209) 0.041	0.075
4	0.33	0.60	(0.209) 0.041	0.075
5	0.42	0.60	(0.209) 0.041	0.075
6	0.50	0.70	(0.209) 0.048	0.088
7	0.58	0.70	(0.209) 0.048	0.088
8	0.67	0.70	(0.209) 0.048	0.088
9	0.75	0.70	(0.209) 0.048	0.088
10	0.83	0.70	(0.209) 0.048	0.088
11	0.92	0.70	(0.209) 0.048	0.088
12	1.00	0.80	(0.209) 0.055	0.100
13	1.08	0.80	(0.209) 0.055	0.100
14	1.17	0.80	(0.209) 0.055	0.100
15	1.25	0.80	(0.209) 0.055	0.100
16	1.33	0.80	(0.209) 0.055	0.100
17	1.42	0.80	(0.209) 0.055	0.100
18	1.50	0.80	(0.209) 0.055	0.100
19	1.58	0.80	(0.209) 0.055	0.100
20	1.67	0.80	(0.209) 0.055	0.100
21	1.75	0.80	(0.209) 0.055	0.100
22	1.83	0.80	(0.209) 0.055	0.100
23	1.92	0.80	(0.209) 0.055	0.100
24	2.00	0.90	(0.209) 0.062	0.113
25	2.08	0.80	(0.209) 0.055	0.100
26	2.17	0.90	(0.209) 0.062	0.113
27	2.25	0.90	(0.209) 0.062	0.113
28	2.33	0.90	(0.209) 0.062	0.113
29	2.42	0.90	(0.209) 0.062	0.113
30	2.50	0.90	(0.209) 0.062	0.113
31	2.58	0.90	(0.209) 0.062	0.113
32	2.67	0.90	(0.209) 0.062	0.113
33	2.75	1.00	(0.209) 0.069	0.125
34	2.83	1.00	(0.209) 0.069	0.125

24-HOUR STORM DURATION

Unit Hydrograph Analysis

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Study date 01/31/18 File: ARAPOST2410.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(FT.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 1.60 18.40

100 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
11.50 4.10 47.15

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.100(In)

Point rain (area averaged) = 2.629(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.628(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	53.1	0.540	0.681	0.209	1.000	0.209
					Sum (F)	0.209

Area averaged mean soil loss (F) (In/Hr) = 0.209

Minimum soil loss rate ((In/Hr)) = 0.105
(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.355

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution	Unit Hydrograph Graph %	Unit Hydrograph (CFS)
1	0.083	102.533	19.977	2.315
2	0.167	205.065	48.572	5.629
3	0.250	307.598	15.265	1.769
4	0.333	410.130	6.930	0.803
5	0.417	512.663	3.876	0.449
6	0.500	615.195	2.499	0.290
7	0.583	717.728	1.522	0.176
8	0.667	820.260	1.359	0.158
		Sum = 100.000	Sum=	11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate (In./Hr) Max | Low	Effective (In/Hr)
1	0.08	0.07	(0.371) 0.007	0.014
2	0.17	0.07	(0.369) 0.007	0.014
3	0.25	0.07	(0.368) 0.007	0.014
4	0.33	0.10	(0.367) 0.011	0.020
5	0.42	0.10	(0.365) 0.011	0.020
6	0.50	0.10	(0.364) 0.011	0.020
7	0.58	0.10	(0.362) 0.011	0.020
8	0.67	0.10	(0.361) 0.011	0.020
9	0.75	0.10	(0.359) 0.011	0.020
10	0.83	0.13	(0.358) 0.015	0.027
11	0.92	0.13	(0.357) 0.015	0.027
12	1.00	0.13	(0.355) 0.015	0.027
13	1.08	0.10	(0.354) 0.011	0.020
14	1.17	0.10	(0.352) 0.011	0.020
15	1.25	0.10	(0.351) 0.011	0.020
16	1.33	0.10	(0.350) 0.011	0.020
17	1.42	0.10	(0.348) 0.011	0.020
18	1.50	0.10	(0.347) 0.011	0.020
19	1.58	0.10	(0.345) 0.011	0.020
20	1.67	0.10	(0.344) 0.011	0.020
21	1.75	0.10	(0.343) 0.011	0.020
22	1.83	0.13	(0.341) 0.015	0.027
23	1.92	0.13	(0.340) 0.015	0.027
24	2.00	0.13	(0.339) 0.015	0.027
25	2.08	0.13	(0.337) 0.015	0.027
26	2.17	0.13	(0.336) 0.015	0.027
27	2.25	0.13	(0.334) 0.015	0.027
28	2.33	0.13	(0.333) 0.015	0.027
29	2.42	0.13	(0.332) 0.015	0.027
30	2.50	0.13	(0.330) 0.015	0.027
31	2.58	0.17	(0.329) 0.019	0.034
32	2.67	0.17	(0.328) 0.019	0.034
33	2.75	0.17	(0.326) 0.019	0.034
34	2.83	0.17	(0.325) 0.019	0.034

35	2.92	0.17	0.053	(0.324)	0.019	0.034		106	8.83	0.57	0.179	(0.236)	0.063	0.115
36	3.00	0.17	0.053	(0.322)	0.019	0.034		107	8.92	0.57	0.179	(0.235)	0.063	0.115
37	3.08	0.17	0.053	(0.321)	0.019	0.034		108	9.00	0.57	0.179	(0.234)	0.063	0.115
38	3.17	0.17	0.053	(0.320)	0.019	0.034		109	9.08	0.63	0.200	(0.233)	0.071	0.129
39	3.25	0.17	0.053	(0.318)	0.019	0.034		110	9.17	0.63	0.200	(0.232)	0.071	0.129
40	3.33	0.17	0.053	(0.317)	0.019	0.034		111	9.25	0.63	0.200	(0.231)	0.071	0.129
41	3.42	0.17	0.053	(0.316)	0.019	0.034		112	9.33	0.67	0.210	(0.230)	0.075	0.136
42	3.50	0.17	0.053	(0.314)	0.019	0.034		113	9.42	0.67	0.210	(0.228)	0.075	0.136
43	3.58	0.17	0.053	(0.313)	0.019	0.034		114	9.50	0.67	0.210	(0.227)	0.075	0.136
44	3.67	0.17	0.053	(0.312)	0.019	0.034		115	9.58	0.70	0.221	(0.226)	0.078	0.142
45	3.75	0.17	0.053	(0.310)	0.019	0.034		116	9.67	0.70	0.221	(0.225)	0.078	0.142
46	3.83	0.20	0.063	(0.309)	0.022	0.041		117	9.75	0.70	0.221	(0.224)	0.078	0.142
47	3.92	0.20	0.063	(0.308)	0.022	0.041		118	9.83	0.73	0.231	(0.223)	0.082	0.149
48	4.00	0.20	0.063	(0.306)	0.022	0.041		119	9.92	0.73	0.231	(0.222)	0.082	0.149
49	4.08	0.20	0.063	(0.305)	0.022	0.041		120	10.00	0.73	0.231	(0.221)	0.082	0.149
50	4.17	0.20	0.063	(0.304)	0.022	0.041		121	10.08	0.50	0.158	(0.220)	0.056	0.102
51	4.25	0.20	0.063	(0.303)	0.022	0.041		122	10.17	0.50	0.158	(0.219)	0.056	0.102
52	4.33	0.23	0.074	(0.301)	0.026	0.047		123	10.25	0.50	0.158	(0.218)	0.056	0.102
53	4.42	0.23	0.074	(0.300)	0.026	0.047		124	10.33	0.50	0.158	(0.217)	0.056	0.102
54	4.50	0.23	0.074	(0.299)	0.026	0.047		125	10.42	0.50	0.158	(0.216)	0.056	0.102
55	4.58	0.23	0.074	(0.297)	0.026	0.047		126	10.50	0.50	0.158	(0.215)	0.056	0.102
56	4.67	0.23	0.074	(0.296)	0.026	0.047		127	10.58	0.67	0.210	(0.213)	0.075	0.136
57	4.75	0.23	0.074	(0.295)	0.026	0.047		128	10.67	0.67	0.210	(0.212)	0.075	0.136
58	4.83	0.27	0.084	(0.294)	0.030	0.054		129	10.75	0.67	0.210	(0.211)	0.075	0.136
59	4.92	0.27	0.084	(0.292)	0.030	0.054		130	10.83	0.67	0.210	(0.210)	0.075	0.136
60	5.00	0.27	0.084	(0.291)	0.030	0.054		131	10.92	0.67	0.210	(0.209)	0.075	0.136
61	5.08	0.20	0.063	(0.290)	0.022	0.041		132	11.00	0.67	0.210	(0.208)	0.075	0.136
62	5.17	0.20	0.063	(0.289)	0.022	0.041		133	11.08	0.63	0.200	(0.207)	0.071	0.129
63	5.25	0.20	0.063	(0.287)	0.022	0.041		134	11.17	0.63	0.200	(0.206)	0.071	0.129
64	5.33	0.23	0.074	(0.286)	0.026	0.047		135	11.25	0.63	0.200	(0.205)	0.071	0.129
65	5.42	0.23	0.074	(0.285)	0.026	0.047		136	11.33	0.63	0.200	(0.204)	0.071	0.129
66	5.50	0.23	0.074	(0.284)	0.026	0.047		137	11.42	0.63	0.200	(0.203)	0.071	0.129
67	5.58	0.27	0.084	(0.282)	0.030	0.054		138	11.50	0.63	0.200	(0.202)	0.071	0.129
68	5.67	0.27	0.084	(0.281)	0.030	0.054		139	11.58	0.57	0.179	(0.201)	0.063	0.115
69	5.75	0.27	0.084	(0.280)	0.030	0.054		140	11.67	0.57	0.179	(0.200)	0.063	0.115
70	5.83	0.27	0.084	(0.279)	0.030	0.054		141	11.75	0.57	0.179	(0.199)	0.063	0.115
71	5.92	0.27	0.084	(0.277)	0.030	0.054		142	11.83	0.60	0.189	(0.198)	0.067	0.122
72	6.00	0.27	0.084	(0.276)	0.030	0.054		143	11.92	0.60	0.189	(0.197)	0.067	0.122
73	6.08	0.30	0.095	(0.275)	0.034	0.061		144	12.00	0.60	0.189	(0.196)	0.067	0.122
74	6.17	0.30	0.095	(0.274)	0.034	0.061		145	12.08	0.83	0.263	(0.195)	0.093	0.169
75	6.25	0.30	0.095	(0.272)	0.034	0.061		146	12.17	0.83	0.263	(0.194)	0.093	0.169
76	6.33	0.30	0.095	(0.271)	0.034	0.061		147	12.25	0.83	0.263	(0.193)	0.093	0.169
77	6.42	0.30	0.095	(0.270)	0.034	0.061		148	12.33	0.87	0.273	(0.192)	0.097	0.176
78	6.50	0.30	0.095	(0.269)	0.034	0.061		149	12.42	0.87	0.273	(0.191)	0.097	0.176
79	6.58	0.33	0.105	(0.268)	0.037	0.068		150	12.50	0.87	0.273	(0.190)	0.097	0.176
80	6.67	0.33	0.105	(0.266)	0.037	0.068		151	12.58	0.93	0.294	(0.189)	0.105	0.190
81	6.75	0.33	0.105	(0.265)	0.037	0.068		152	12.67	0.93	0.294	(0.189)	0.105	0.190
82	6.83	0.33	0.105	(0.264)	0.037	0.068		153	12.75	0.93	0.294	(0.188)	0.105	0.190
83	6.92	0.33	0.105	(0.263)	0.037	0.068		154	12.83	0.97	0.305	(0.187)	0.108	0.197
84	7.00	0.33	0.105	(0.262)	0.037	0.068		155	12.92	0.97	0.305	(0.186)	0.108	0.197
85	7.08	0.33	0.105	(0.260)	0.037	0.068		156	13.00	0.97	0.305	(0.185)	0.108	0.197
86	7.17	0.33	0.105	(0.259)	0.037	0.068		157	13.08	1.13	0.357	(0.184)	0.127	0.230
87	7.25	0.33	0.105	(0.258)	0.037	0.068		158	13.17	1.13	0.357	(0.183)	0.127	0.230
88	7.33	0.37	0.116	(0.257)	0.041	0.075		159	13.25	1.13	0.357	(0.182)	0.127	0.230
89	7.42	0.37	0.116	(0.256)	0.041	0.075		160	13.33	1.13	0.357	(0.181)	0.127	0.230
90	7.50	0.37	0.116	(0.255)	0.041	0.075		161	13.42	1.13	0.357	(0.180)	0.127	0.230
91	7.58	0.40	0.126	(0.253)	0.045	0.081		162	13.50	1.13	0.357	(0.179)	0.127	0.230
92	7.67	0.40	0.126	(0.252)	0.045	0.081		163	13.58	0.77	0.242	(0.178)	0.086	0.156
93	7.75	0.40	0.126	(0.251)	0.045	0.081		164	13.67	0.77	0.242	(0.177)	0.086	0.156
94	7.83	0.43	0.137	(0.250)	0.049	0.088		165	13.75	0.77	0.242	(0.176)	0.086	0.156
95	7.92	0.43	0.137	(0.249)	0.049	0.088		166	13.83	0.77	0.242	(0.176)	0.086	0.156
96	8.00	0.43	0.137	(0.248)	0.049	0.088		167	13.92	0.77	0.242	(0.175)	0.086	0.156
97	8.08	0.50	0.158	(0.246)	0.056	0.102		168	14.00	0.77	0.242	(0.174)	0.086	0.156
98	8.17	0.50	0.158	(0.245)	0.056	0.102		169	14.08	0.90	0.284	(0.173)	0.101	0.183
99	8.25	0.50	0.158	(0.244)	0.056	0.102		170	14.17	0.90	0.284	(0.172)	0.101	0.183
100	8.33	0.50	0.158	(0.243)	0.056	0.102		171	14.25	0.90	0.284	(0.171)	0.101	0.183
101	8.42	0.50	0.158	(0.242)	0.056	0.102		172	14.33	0.87	0.273	(0.170)	0.097	0.176
102	8.50	0.50	0.158	(0.241)	0.056	0.102		173	14.42	0.87	0.273	(0.169)	0.097	0.176
103	8.58	0.53	0.168	(0.240)	0.060	0.108		174	14.50	0.87	0.273	(0.168)	0.097	0.176
104	8.67	0.53	0.168	(0.238)	0.060	0.108		175	14.58	0.87	0.273	(0.168)	0.097	0.176
105	8.75	0.53	0.168	(0.237)	0.060	0.108		176	14.67	0.87	0.273	(0.167)	0.097	0.176

177	14.75	0.87	0.273	(0.166)	0.097	0.176		248	20.67	0.10	0.032	(0.117)	0.011	0.020
178	14.83	0.83	0.263	(0.165)	0.093	0.169		249	20.75	0.10	0.032	(0.117)	0.011	0.020
179	14.92	0.83	0.263	(0.164)	0.093	0.169		250	20.83	0.07	0.021	(0.116)	0.007	0.014
180	15.00	0.83	0.263	(0.163)	0.093	0.169		251	20.92	0.07	0.021	(0.116)	0.007	0.014
181	15.08	0.80	0.252	(0.163)	0.090	0.163		252	21.00	0.07	0.021	(0.115)	0.007	0.014
182	15.17	0.80	0.252	(0.162)	0.090	0.163		253	21.08	0.10	0.032	(0.115)	0.011	0.020
183	15.25	0.80	0.252	(0.161)	0.090	0.163		254	21.17	0.10	0.032	(0.115)	0.011	0.020
184	15.33	0.77	0.242	(0.160)	0.086	0.156		255	21.25	0.10	0.032	(0.114)	0.011	0.020
185	15.42	0.77	0.242	(0.159)	0.086	0.156		256	21.33	0.07	0.021	(0.114)	0.007	0.014
186	15.50	0.77	0.242	(0.158)	0.086	0.156		257	21.42	0.07	0.021	(0.113)	0.007	0.014
187	15.58	0.63	0.200	(0.158)	0.071	0.129		258	21.50	0.07	0.021	(0.113)	0.007	0.014
188	15.67	0.63	0.200	(0.157)	0.071	0.129		259	21.58	0.10	0.032	(0.112)	0.011	0.020
189	15.75	0.63	0.200	(0.156)	0.071	0.129		260	21.67	0.10	0.032	(0.112)	0.011	0.020
190	15.83	0.63	0.200	(0.155)	0.071	0.129		261	21.75	0.10	0.032	(0.112)	0.011	0.020
191	15.92	0.63	0.200	(0.154)	0.071	0.129		262	21.83	0.07	0.021	(0.111)	0.007	0.014
192	16.00	0.63	0.200	(0.154)	0.071	0.129		263	21.92	0.07	0.021	(0.111)	0.007	0.014
193	16.08	0.13	0.042	(0.153)	0.015	0.027		264	22.00	0.07	0.021	(0.110)	0.007	0.014
194	16.17	0.13	0.042	(0.152)	0.015	0.027		265	22.08	0.10	0.032	(0.110)	0.011	0.020
195	16.25	0.13	0.042	(0.151)	0.015	0.027		266	22.17	0.10	0.032	(0.110)	0.011	0.020
196	16.33	0.13	0.042	(0.150)	0.015	0.027		267	22.25	0.10	0.032	(0.109)	0.011	0.020
197	16.42	0.13	0.042	(0.150)	0.015	0.027		268	22.33	0.07	0.021	(0.109)	0.007	0.014
198	16.50	0.13	0.042	(0.149)	0.015	0.027		269	22.42	0.07	0.021	(0.109)	0.007	0.014
199	16.58	0.10	0.032	(0.148)	0.011	0.020		270	22.50	0.07	0.021	(0.108)	0.007	0.014
200	16.67	0.10	0.032	(0.147)	0.011	0.020		271	22.58	0.07	0.021	(0.108)	0.007	0.014
201	16.75	0.10	0.032	(0.147)	0.011	0.020		272	22.67	0.07	0.021	(0.108)	0.007	0.014
202	16.83	0.10	0.032	(0.146)	0.011	0.020		273	22.75	0.07	0.021	(0.107)	0.007	0.014
203	16.92	0.10	0.032	(0.145)	0.011	0.020		274	22.83	0.07	0.021	(0.107)	0.007	0.014
204	17.00	0.10	0.032	(0.144)	0.011	0.020		275	22.92	0.07	0.021	(0.107)	0.007	0.014
205	17.08	0.17	0.053	(0.144)	0.019	0.034		276	23.00	0.07	0.021	(0.107)	0.007	0.014
206	17.17	0.17	0.053	(0.143)	0.019	0.034		277	23.08	0.07	0.021	(0.106)	0.007	0.014
207	17.25	0.17	0.053	(0.142)	0.019	0.034		278	23.17	0.07	0.021	(0.106)	0.007	0.014
208	17.33	0.17	0.053	(0.142)	0.019	0.034		279	23.25	0.07	0.021	(0.106)	0.007	0.014
209	17.42	0.17	0.053	(0.141)	0.019	0.034		280	23.33	0.07	0.021	(0.106)	0.007	0.014
210	17.50	0.17	0.053	(0.140)	0.019	0.034		281	23.42	0.07	0.021	(0.106)	0.007	0.014
211	17.58	0.17	0.053	(0.139)	0.019	0.034		282	23.50	0.07	0.021	(0.105)	0.007	0.014
212	17.67	0.17	0.053	(0.139)	0.019	0.034		283	23.58	0.07	0.021	(0.105)	0.007	0.014
213	17.75	0.17	0.053	(0.138)	0.019	0.034		284	23.67	0.07	0.021	(0.105)	0.007	0.014
214	17.83	0.13	0.042	(0.137)	0.015	0.027		285	23.75	0.07	0.021	(0.105)	0.007	0.014
215	17.92	0.13	0.042	(0.137)	0.015	0.027		286	23.83	0.07	0.021	(0.105)	0.007	0.014
216	18.00	0.13	0.042	(0.136)	0.015	0.027		287	23.92	0.07	0.021	(0.105)	0.007	0.014
217	18.08	0.13	0.042	(0.135)	0.015	0.027		288	24.00	0.07	0.021	(0.105)	0.007	0.014
218	18.17	0.13	0.042	(0.135)	0.015	0.027								
219	18.25	0.13	0.042	(0.134)	0.015	0.027								
220	18.33	0.13	0.042	(0.133)	0.015	0.027								
221	18.42	0.13	0.042	(0.133)	0.015	0.027								
222	18.50	0.13	0.042	(0.132)	0.015	0.027								
223	18.58	0.10	0.032	(0.131)	0.011	0.020								
224	18.67	0.10	0.032	(0.131)	0.011	0.020								
225	18.75	0.10	0.032	(0.130)	0.011	0.020								
226	18.83	0.07	0.021	(0.130)	0.007	0.014								
227	18.92	0.07	0.021	(0.129)	0.007	0.014								
228	19.00	0.07	0.021	(0.128)	0.007	0.014								
229	19.08	0.10	0.032	(0.128)	0.011	0.020								
230	19.17	0.10	0.032	(0.127)	0.011	0.020								
231	19.25	0.10	0.032	(0.127)	0.011	0.020								
232	19.33	0.13	0.042	(0.126)	0.015	0.027								
233	19.42	0.13	0.042	(0.125)	0.015	0.027								
234	19.50	0.13	0.042	(0.125)	0.015	0.027								
235	19.58	0.10	0.032	(0.124)	0.011	0.020								
236	19.67	0.10	0.032	(0.124)	0.011	0.020								
237	19.75	0.10	0.032	(0.123)	0.011	0.020								
238	19.83	0.07	0.021	(0.123)	0.007	0.014								
239	19.92	0.07	0.021	(0.122)	0.007	0.014								
240	20.00	0.07	0.021	(0.121)	0.007	0.014								
241	20.08	0.10	0.032	(0.121)	0.011	0.020								
242	20.17	0.10	0.032	(0.120)	0.011	0.020								
243	20.25	0.10	0.032	(0.120)	0.011	0.020								
244	20.33	0.10	0.032	(0.119)	0.011	0.020								
245	20.42	0.10	0.032	(0.119)	0.011	0.020								
246	20.50	0.10	0.032	(0.118)	0.011	0.020								
247	20.58	0.10	0.032	(0.118)	0.011	0.020								

(Loss Rate Not Used)

Sum = 100.0 Sum = 20.3

Flood volume = Effective rainfall 1.69(In)
times area 11.5(Ac.)/(In)/(Ft.)] = 1.6(Ac.Ft)

Total soil loss = 0.93(In)
Total soil loss = 0.895(Ac.Ft)
Total rainfall = 2.63(In)
Flood volume = 70750.8 Cubic Feet
Total soil loss = 38974.4 Cubic Feet

Peak flow rate of this hydrograph = 2.661(CFS)

+++++
24 - H O U R S T O R M
Runoff Hydrograph

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m) Volume Ac.Ft Q(CFS) 0 2.5 5.0 7.5 10.0

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0002	0.03	Q					
0+10	0.0010	0.11	Q					
0+15	0.0019	0.13	Q					
0+20	0.0030	0.16	Q					
0+25	0.0044	0.20	Q					
0+30	0.0059	0.22	Q					
0+35	0.0074	0.23	Q					
0+40	0.0090	0.23	Q					
0+45	0.0106	0.23	Q					

0+50	0.0123	0.25	VQ			6+45	0.2342	0.77	Q V	
0+55	0.0143	0.29	VQ			6+50	0.2395	0.78	Q V	
1+ 0	0.0164	0.30	VQ			6+55	0.2449	0.78	Q V	
1+ 5	0.0184	0.29	VQ			7+ 0	0.2503	0.78	Q V	
1+10	0.0202	0.26	VQ			7+ 5	0.2557	0.79	Q V	
1+15	0.0219	0.25	Q			7+10	0.2611	0.79	Q V	
1+20	0.0236	0.24	Q			7+15	0.2666	0.79	Q V	
1+25	0.0252	0.24	Q			7+20	0.2721	0.80	Q V	
1+30	0.0268	0.24	Q			7+25	0.2779	0.84	Q V	
1+35	0.0285	0.24	Q			7+30	0.2837	0.85	Q V	
1+40	0.0301	0.24	Q			7+35	0.2897	0.87	Q V	
1+45	0.0317	0.24	Q			7+40	0.2960	0.91	Q V	
1+50	0.0335	0.25	VQ			7+45	0.3024	0.93	Q V	
1+55	0.0355	0.29	VQ			7+50	0.3090	0.95	Q V	
2+ 0	0.0375	0.30	VQ			7+55	0.3158	0.99	Q V	
2+ 5	0.0396	0.31	VQ			8+ 0	0.3228	1.01	Q V	
2+10	0.0418	0.31	Q			8+ 5	0.3300	1.05	Q V	
2+15	0.0439	0.31	Q			8+10	0.3377	1.13	Q V	
2+20	0.0461	0.31	Q			8+15	0.3456	1.15	Q V	
2+25	0.0483	0.31	Q			8+20	0.3537	1.16	Q V	
2+30	0.0504	0.31	Q			8+25	0.3617	1.17	Q V	
2+35	0.0527	0.33	Q			8+30	0.3698	1.17	Q V	
2+40	0.0552	0.37	Q			8+35	0.3780	1.19	Q V	
2+45	0.0579	0.38	Q			8+40	0.3865	1.23	Q V	
2+50	0.0605	0.39	Q			8+45	0.3951	1.25	Q V	
2+55	0.0632	0.39	Q			8+50	0.4038	1.27	Q V	
3+ 0	0.0659	0.39	Q			8+55	0.4128	1.31	Q V	
3+ 5	0.0686	0.39	Q			9+ 0	0.4219	1.32	Q V	
3+10	0.0713	0.39	Q			9+ 5	0.4313	1.36	Q V	
3+15	0.0740	0.39	Q			9+10	0.4412	1.44	Q V	
3+20	0.0767	0.39	Q			9+15	0.4513	1.47	Q V	
3+25	0.0794	0.39	Q			9+20	0.4616	1.49	Q V	
3+30	0.0821	0.39	VQ			9+25	0.4722	1.54	Q V	
3+35	0.0848	0.39	VQ			9+30	0.4829	1.55	Q V	
3+40	0.0875	0.39	VQ			9+35	0.4938	1.58	Q V	
3+45	0.0902	0.39	VQ			9+40	0.5049	1.62	Q V	
3+50	0.0931	0.41	VQ			9+45	0.5162	1.64	Q V	
3+55	0.0961	0.45	VQ			9+50	0.5276	1.66	Q V	
4+ 0	0.0993	0.46	VQ			9+55	0.5393	1.70	Q V	
4+ 5	0.1025	0.46	VQ			10+ 0	0.5511	1.71	Q V	
4+10	0.1057	0.47	VQ			10+ 5	0.5622	1.61	Q V	
4+15	0.1089	0.47	VQ			10+10	0.5715	1.35	Q V	
4+20	0.1123	0.49	VQ			10+15	0.5802	1.27	Q V	
4+25	0.1159	0.53	Q			10+20	0.5887	1.23	Q V	
4+30	0.1196	0.54	Q			10+25	0.5970	1.21	Q V	
4+35	0.1234	0.54	VQ			10+30	0.6052	1.20	Q V	
4+40	0.1271	0.55	VQ			10+35	0.6140	1.27	Q V	
4+45	0.1309	0.55	VQ			10+40	0.6239	1.45	Q V	
4+50	0.1348	0.56	VQ			10+45	0.6343	1.51	Q V	
4+55	0.1389	0.60	VQ			10+50	0.6449	1.54	Q V	
5+ 0	0.1432	0.62	VQ			10+55	0.6556	1.55	Q V	
5+ 5	0.1472	0.59	VQ			11+ 0	0.6663	1.56	Q V	
5+10	0.1508	0.52	VQ			11+ 5	0.6770	1.55	Q V	
5+15	0.1542	0.49	Q V			11+10	0.6875	1.52	Q V	
5+20	0.1577	0.50	VQ			11+15	0.6979	1.51	Q V	
5+25	0.1613	0.53	VQ			11+20	0.7082	1.50	Q V	
5+30	0.1651	0.54	Q V			11+25	0.7185	1.50	Q V	
5+35	0.1689	0.56	Q V			11+30	0.7288	1.50	Q V	
5+40	0.1731	0.60	Q V			11+35	0.7389	1.46	Q V	
5+45	0.1773	0.61	Q V			11+40	0.7484	1.39	Q V	
5+50	0.1816	0.62	Q V			11+45	0.7578	1.36	Q V	
5+55	0.1859	0.62	Q V			11+50	0.7672	1.37	Q V	
6+ 0	0.1902	0.63	Q V			11+55	0.7769	1.40	Q V	
6+ 5	0.1946	0.64	Q V			12+ 0	0.7865	1.41	Q V	
6+10	0.1993	0.68	Q V			12+ 5	0.7970	1.52	Q V	
6+15	0.2041	0.69	Q V			12+10	0.8093	1.79	Q V	
6+20	0.2089	0.70	Q V			12+15	0.8222	1.87	Q V	
6+25	0.2138	0.70	Q V			12+20	0.8355	1.93	Q V	
6+30	0.2186	0.71	Q V			12+25	0.8492	1.99	Q V	
6+35	0.2236	0.72	Q V			12+30	0.8631	2.02	Q V	
6+40	0.2289	0.76	Q V			12+35	0.8773	2.06	Q V	

12+40	0.8921	2.15	○	○	V	○				18+35	1.5338	0.30	○
12+45	0.9070	2.17	○	○	V	○				18+40	1.5356	0.26	○
12+50	0.9222	2.20	○	○	V	○				18+45	1.5373	0.25	○
12+55	0.9377	2.25	○	○	V	○				18+50	1.5388	0.23	○
13+ 0	0.9533	2.26	○	○	V	○				18+55	1.5401	0.19	○
13+ 5	0.9694	2.35	○	○	V	○				19+ 0	1.5413	0.17	○
13+10	0.9870	2.54	○	○	V	○				19+ 5	1.5426	0.18	○
13+15	1.0049	2.61	○	○	V	○				19+10	1.5440	0.22	○
13+20	1.0231	2.64	○	○	V	○				19+15	1.5456	0.23	○
13+25	1.0413	2.65	○	○	V	○				19+20	1.5473	0.25	○
13+30	1.0597	2.66	○	○	V	○				19+25	1.5492	0.29	○
13+35	1.0768	2.49	○	○	V	○				19+30	1.5513	0.30	○
13+40	1.0912	2.08	○	○	V	○				19+35	1.5533	0.29	○
13+45	1.1046	1.95	○	○	V	○				19+40	1.5551	0.26	○
13+50	1.1176	1.89	○	○	V	○				19+45	1.5568	0.25	○
13+55	1.1304	1.85	○	○	V	○				19+50	1.5583	0.23	○
14+ 0	1.1430	1.83	○	○	V	○				19+55	1.5596	0.19	○
14+ 5	1.1560	1.88	○	○	V	○				20+ 0	1.5608	0.17	○
14+10	1.1699	2.02	○	○	V	○				20+ 5	1.5620	0.18	○
14+15	1.1842	2.07	○	○	V	○				20+10	1.5635	0.22	○
14+20	1.1985	2.08	○	○	V	○				20+15	1.5651	0.23	○
14+25	1.2126	2.05	○	○	V	○				20+20	1.5667	0.23	○
14+30	1.2267	2.05	○	○	V	○				20+25	1.5683	0.23	○
14+35	1.2408	2.05	○	○	V	○				20+30	1.5699	0.23	○
14+40	1.2549	2.05	○	○	V	○				20+35	1.5715	0.23	○
14+45	1.2690	2.05	○	○	V	○				20+40	1.5731	0.24	○
14+50	1.2830	2.03	○	○	V	○				20+45	1.5747	0.24	○
14+55	1.2967	1.99	○	○	V	○				20+50	1.5762	0.22	○
15+ 0	1.3103	1.98	○	○	V	○				20+55	1.5775	0.18	○
15+ 5	1.3238	1.96	○	○	V	○				21+ 0	1.5787	0.17	○
15+10	1.3370	1.92	○	○	V	○				21+ 5	1.5799	0.18	○
15+15	1.3501	1.90	○	○	V	○				21+10	1.5814	0.22	○
15+20	1.3630	1.88	○	○	V	○				21+15	1.5829	0.23	○
15+25	1.3757	1.84	○	○	V	○				21+20	1.5844	0.21	○
15+30	1.3882	1.82	○	○	V	○				21+25	1.5856	0.18	○
15+35	1.4003	1.75	○	○	V	○				21+30	1.5868	0.17	○
15+40	1.4113	1.60	○	○	V	○				21+35	1.5880	0.18	○
15+45	1.4219	1.55	○	○	V	○				21+40	1.5895	0.22	○
15+50	1.4324	1.52	○	○	V	○				21+45	1.5911	0.23	○
15+55	1.4428	1.51	○	○	V	○				21+50	1.5925	0.21	○
16+ 0	1.4532	1.50	○	○	V	○				21+55	1.5938	0.18	○
16+ 5	1.4619	1.26	○	○	V	○				22+ 0	1.5949	0.17	○
16+10	1.4666	0.69	○	○	V	○				22+ 5	1.5962	0.18	○
16+15	1.4701	0.51	○	○	V	○				22+10	1.5976	0.22	○
16+20	1.4730	0.42	○	○	V	○				22+15	1.5992	0.23	○
16+25	1.4756	0.38	○	○	V	○				22+20	1.6007	0.21	○
16+30	1.4780	0.35	○	○	V	○				22+25	1.6019	0.18	○
16+35	1.4802	0.31	○	○	V	○				22+30	1.6030	0.17	○
16+40	1.4820	0.26	○	○	V	○				22+35	1.6042	0.16	○
16+45	1.4837	0.25	○	○	V	○				22+40	1.6053	0.16	○
16+50	1.4853	0.24	○	○	V	○				22+45	1.6064	0.16	○
16+55	1.4870	0.24	○	○	V	○				22+50	1.6075	0.16	○
17+ 0	1.4886	0.24	○	○	V	○				22+55	1.6086	0.16	○
17+ 5	1.4905	0.27	○	○	V	○				23+ 0	1.6096	0.16	○
17+10	1.4929	0.34	○	○	V	○				23+ 5	1.6107	0.16	○
17+15	1.4954	0.37	○	○	V	○				23+10	1.6118	0.16	○
17+20	1.4980	0.38	○	○	V	○				23+15	1.6129	0.16	○
17+25	1.5006	0.38	○	○	V	○				23+20	1.6140	0.16	○
17+30	1.5033	0.39	○	○	V	○				23+25	1.6150	0.16	○
17+35	1.5060	0.39	○	○	V	○				23+30	1.6161	0.16	○
17+40	1.5087	0.39	○	○	V	○				23+35	1.6172	0.16	○
17+45	1.5114	0.39	○	○	V	○				23+40	1.6183	0.16	○
17+50	1.5140	0.38	○	○	V	○				23+45	1.6194	0.16	○
17+55	1.5164	0.34	○	○	V	○				23+50	1.6205	0.16	○
18+ 0	1.5186	0.33	○	○	V	○				23+55	1.6215	0.16	○
18+ 5	1.5208	0.32	○	○	V	○				24+ 0	1.6226	0.16	○
18+10	1.5230	0.32	○	○	V	○				24+ 5	1.6235	0.13	○
18+15	1.5252	0.32	○	○	V	○				24+10	1.6238	0.05	○
18+20	1.5274	0.32	○	○	V	○				24+15	1.6240	0.03	○
18+25	1.5295	0.31	○	○	V	○				24+20	1.6241	0.01	○
18+30	1.5317	0.31	○	○	V	○				24+25	1.6242	0.01	○

24+30	1.6242	0.00	Q	|				v|
24+35	1.6242	0.00	Q	|	|	|	v	

APPENDIX D.4: 100-YEAR STORM EVENT

1-HOUR STORM DURATION

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
Study date 01/30/18 File: ARAPOST1100.out

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used
English Units used in output format

250.02.16
UNIT HYDROGRAPH FOR AREA A
POST-PROJECT CONDITION
FN: ARAPOST

Drainage Area = 11.50(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areaal Adjustment = 11.50(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 3338.00(Ft.)
Length along longest watercourse measured to centroid = 1232.00(Ft.)
Length along longest watercourse = 0.632 Mi.
Length along longest watercourse measured to centroid = 0.233 Mi.
Difference in elevation = 34.70(Feet.)
Slope along watercourse = 54.8880 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.081 Hr.
Lag time = 4.88 Min.
25% of lag time = 1.22 Min.
40% of lag time = 1.95 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	0.45	5.17

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.50	1.20	13.80

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.450(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 1.200(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.200(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %
11.500 53.10 0.681
Total Area Entered = 11.50(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
53.1	53.1	0.540	0.681	0.209	1.000	0.209
						Sum (F) = 0.209

Area averaged mean soil loss (F) (In/Hr) = 0.209
Minimum soil loss rate ((In/Hr)) = 0.105
(for 24 hour storm duration)

Soil loss rate (decimal) = 0.355

Slope of intensity-duration curve for a 1 hour storm = 0.5000

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period Time % of lag Distribution Unit Hydrograph
(hrs) Graph % (CFS)

1	0.083	102.533	19.977	2.315
2	0.167	205.065	48.572	5.629
3	0.250	307.598	15.265	1.769
4	0.333	410.130	6.930	0.803
5	0.417	512.663	3.876	0.449
6	0.500	615.195	2.499	0.290
7	0.583	717.728	1.522	0.176
8	0.667	820.260	1.359	0.158
			Sum = 100.000	Sum= 11.590

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time	Pattern	Storm Rain	Loss rate(In./Hr.)	Effective
(Hr.)	Percent	(In/Hr)	Max | Low	(In/Hr)	
1	0.08	4.20	0.605	0.209 (0.215)	0.396
2	0.17	4.30	0.619	0.209 (0.220)	0.410
3	0.25	5.00	0.720	0.209 (0.256)	0.511
4	0.33	5.00	0.720	0.209 (0.256)	0.511
5	0.42	5.80	0.835	0.209 (0.297)	0.626
6	0.50	6.50	0.936	0.209 (0.332)	0.727
7	0.58	7.40	1.065	0.209 (0.378)	0.856
8	0.67	8.60	1.238	0.209 (0.440)	1.029
9	0.75	12.30	1.771	0.209 (0.629)	1.562
10	0.83	29.10	4.190	0.209 (1.488)	3.981
11	0.92	6.80	0.979	0.209 (0.348)	0.770
12	1.00	5.00	0.720	0.209 (0.256)	0.511
			(Loss Rate Not Used)		
			Sum = 100.0		Sum = 11.9

Flood volume = Effective rainfall 0.99(In)
times area 11.5(Ac.)/(1(In)/(Ft.)) = 0.9(Ac.Ft)
Total soil loss = 0.21(In)
Total soil loss = 0.200(Ac.Ft)
Total rainfall = 1.20(In)
Flood volume = 41356.5 Cubic Feet
Total soil loss = 8732.3 Cubic Feet

Peak flow rate of this hydrograph = 28.583(CFS)

1 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h:m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
-----------	--------------	--------	---	-----	------	------	------

0+ 5	0.0063	0.92	VQ					
0+10	0.0282	3.18	|V Q					
0+15	0.0571	4.19	| V Q					
0+20	0.0922	5.10	| V Q					
0+25	0.1317	5.74	| V Q					
0+30	0.1787	6.82	| V Q					
0+35	0.2339	8.01	| V Q					
0+40	0.2994	9.51	| Q					
0+45	0.3827	12.10	| Q					
0+50	0.5288	21.21	| Q					
0+55	0.7256	28.58	| Q					
1+ 0	0.8273	14.76	| Q					
1+ 5	0.8872	8.70	| Q					
1+10	0.9153	4.08	| Q					
1+15	0.9315	2.35	| Q					
1+20	0.9411	1.40	| Q					
1+25	0.9474	0.91	| Q					
1+30	0.9489	0.21	| Q					
1+35	0.9494	0.08	| Q					

APPENDIX E: HYDRAULIC CALCULATIONS

APPENDIX E.1: DROP INLET CALCULATIONS

DROP INLET CALCULATIONS

Weir Calculation

$$Q = CLH^{3/2}$$

Q_{100} = Discharge from On-site 100 Year Rational Method Study

C= Discharge Coefficent

L = Weir Length

H=Hydraulic Head

DROP INLET	BIORETENTION BASIN	STORM DRAIN	NODE	Q (cfs)	C	L (ft)	H (ft)
DROP INLET A	A	LATERAL A2	111	9.84	3	9.5	0.49
DROP INLET B	B	LINE A - R4	104	5.11	3	5	0.49

APPENDIX E.2: STORM DRAIN NORMAL DEPTH CALCULATIONS

Worksheet for Line A - Reach 1

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.00500 ft/ft
Diameter	2.50 ft
Discharge	15.78 ft ³ /s

Results

Normal Depth	1.31 ft
Flow Area	2.62 ft ²
Wetted Perimeter	4.06 ft
Hydraulic Radius	0.64 ft
Top Width	2.50 ft
Critical Depth	1.34 ft
Percent Full	52.6 %
Critical Slope	0.00468 ft/ft
Velocity	6.03 ft/s
Velocity Head	0.57 ft
Specific Energy	1.88 ft
Froude Number	1.04
Maximum Discharge	31.20 ft ³ /s
Discharge Full	29.00 ft ³ /s
Slope Full	0.00148 ft/ft
Flow Type	SuperCritical

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 ft
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.00 %
Normal Depth Over Rise	52.58 %
Downstream Velocity	Infinity ft/s

Worksheet for Line A - Reach 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.31	ft
Critical Depth	1.34	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00468	ft/ft

Worksheet for Line A - Reach 2

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.00500 ft/ft
Diameter	2.00 ft
Discharge	13.20 ft ³ /s

Results

Normal Depth	1.38 ft
Flow Area	2.32 ft ²
Wetted Perimeter	3.93 ft
Hydraulic Radius	0.59 ft
Top Width	1.85 ft
Critical Depth	1.31 ft
Percent Full	69.2 %
Critical Slope	0.00585 ft/ft
Velocity	5.69 ft/s
Velocity Head	0.50 ft
Specific Energy	1.89 ft
Froude Number	0.89
Maximum Discharge	17.21 ft ³ /s
Discharge Full	16.00 ft ³ /s
Slope Full	0.00341 ft/ft
Flow Type	SubCritical

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 ft
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.00 %
Normal Depth Over Rise	69.24 %
Downstream Velocity	Infinity ft/s

Worksheet for Line A - Reach 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.38	ft
Critical Depth	1.31	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00585	ft/ft

Worksheet for Line A - Reach 3

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.00500 ft/ft
Diameter	2.00 ft
Discharge	9.15 ft ³ /s

Results

Normal Depth	1.08 ft
Flow Area	1.74 ft ²
Wetted Perimeter	3.31 ft
Hydraulic Radius	0.53 ft
Top Width	1.99 ft
Critical Depth	1.08 ft
Percent Full	54.2 %
Critical Slope	0.00506 ft/ft
Velocity	5.26 ft/s
Velocity Head	0.43 ft
Specific Energy	1.51 ft
Froude Number	0.99
Maximum Discharge	17.21 ft ³ /s
Discharge Full	16.00 ft ³ /s
Slope Full	0.00164 ft/ft
Flow Type	SubCritical

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 ft
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.00 %
Normal Depth Over Rise	54.20 %
Downstream Velocity	Infinity ft/s

Worksheet for Line A - Reach 3

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.08	ft
Critical Depth	1.08	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00506	ft/ft

Worksheet for Line A - Reach 4

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.00500 ft/ft
Diameter	1.50 ft
Discharge	6.48 ft ³ /s

Results

Normal Depth	1.08 ft
Flow Area	1.37 ft ²
Wetted Perimeter	3.05 ft
Hydraulic Radius	0.45 ft
Top Width	1.34 ft
Critical Depth	0.98 ft
Percent Full	72.3 %
Critical Slope	0.00647 ft/ft
Velocity	4.74 ft/s
Velocity Head	0.35 ft
Specific Energy	1.43 ft
Froude Number	0.83
Maximum Discharge	7.99 ft ³ /s
Discharge Full	7.43 ft ³ /s
Slope Full	0.00381 ft/ft
Flow Type	SubCritical

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 ft
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.00 %
Normal Depth Over Rise	72.30 %
Downstream Velocity	Infinity ft/s

Worksheet for Line A - Reach 4

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.08	ft
Critical Depth	0.98	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00647	ft/ft

Worksheet for Lateral A1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.00500 ft/ft
Diameter	2.00 ft
Discharge	4.74 ft ³ /s

Results

Normal Depth	0.75	ft
Flow Area	1.07	ft ²
Wetted Perimeter	2.63	ft
Hydraulic Radius	0.41	ft
Top Width	1.93	ft
Critical Depth	0.77	ft
Percent Full	37.3	%
Critical Slope	0.00453	ft/ft
Velocity	4.44	ft/s
Velocity Head	0.31	ft
Specific Energy	1.05	ft
Froude Number	1.05	
Maximum Discharge	17.21	ft ³ /s
Discharge Full	16.00	ft ³ /s
Slope Full	0.00044	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth 0.00 ft
Length 0.00 ft
Number Of Steps 0

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	37.30	%
Downstream Velocity	Infinity	ft/s

Worksheet for Lateral A1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.75	ft
Critical Depth	0.77	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00453	ft/ft

Worksheet for Lateral A2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.00500 ft/ft
Diameter	2.00 ft
Discharge	9.84 ft ³ /s

Results

Normal Depth	1.13	ft
Flow Area	1.84	ft ²
Wetted Perimeter	3.41	ft
Hydraulic Radius	0.54	ft
Top Width	1.98	ft
Critical Depth	1.12	ft
Percent Full	56.7	%
Critical Slope	0.00517	ft/ft
Velocity	5.35	ft/s
Velocity Head	0.45	ft
Specific Energy	1.58	ft
Froude Number	0.98	
Maximum Discharge	17.21	ft ³ /s
Discharge Full	16.00	ft ³ /s
Slope Full	0.00189	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	56.71	%
Downstream Velocity	Infinity	ft/s

Worksheet for Lateral A2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.13	ft
Critical Depth	1.12	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00517	ft/ft

Worksheet for Lateral A3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.00500 ft/ft
Diameter	1.50 ft
Discharge	3.91 ft ³ /s

Results

Normal Depth	0.77	ft
Flow Area	0.92	ft ²
Wetted Perimeter	2.40	ft
Hydraulic Radius	0.38	ft
Top Width	1.50	ft
Critical Depth	0.76	ft
Percent Full	51.6	%
Critical Slope	0.00538	ft/ft
Velocity	4.26	ft/s
Velocity Head	0.28	ft
Specific Energy	1.05	ft
Froude Number	0.96	
Maximum Discharge	7.99	ft ³ /s
Discharge Full	7.43	ft ³ /s
Slope Full	0.00139	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	51.55	%
Downstream Velocity	Infinity	ft/s

Worksheet for Lateral A3

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.77	ft
Critical Depth	0.76	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00538	ft/ft

Worksheet for Line B

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.00500 ft/ft
Diameter	2.00 ft
Discharge	8.99 ft ³ /s

Results

Normal Depth	1.07 ft
Flow Area	1.72 ft ²
Wetted Perimeter	3.29 ft
Hydraulic Radius	0.52 ft
Top Width	1.99 ft
Critical Depth	1.07 ft
Percent Full	53.6 %
Critical Slope	0.00503 ft/ft
Velocity	5.24 ft/s
Velocity Head	0.43 ft
Specific Energy	1.50 ft
Froude Number	1.00
Maximum Discharge	17.21 ft ³ /s
Discharge Full	16.00 ft ³ /s
Slope Full	0.00158 ft/ft
Flow Type	SubCritical

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 ft
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.00 %
Normal Depth Over Rise	53.62 %
Downstream Velocity	Infinity ft/s

Worksheet for Line B

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.07	ft
Critical Depth	1.07	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00503	ft/ft

Worksheet for Line C

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.00500 ft/ft
Diameter	1.50 ft
Discharge	5.11 ft ³ s

Results

Normal Depth	0.91	ft
Flow Area	1.13	ft ²
Wetted Perimeter	2.69	ft
Hydraulic Radius	0.42	ft
Top Width	1.46	ft
Critical Depth	0.87	ft
Percent Full	60.9	%
Critical Slope	0.00582	ft/ft
Velocity	4.53	ft/s
Velocity Head	0.32	ft
Specific Energy	1.23	ft
Froude Number	0.91	
Maximum Discharge	7.99	ft ³ /s
Discharge Full	7.43	ft ³ /s
Slope Full	0.00237	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	60.94	%
Downstream Velocity	Infinity	ft/s

Worksheet for Line C

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.91	ft
Critical Depth	0.87	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00582	ft/ft

APPENDIX E.3: CATCH BASIN NORMAL DEPTH CALCULATION

Worksheet for Catch Basin 1

Project Description

Solve For Efficiency

Input Data

Discharge	5.11	ft ³ /s
Slope	0.00547	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	14.00	ft
Local Depression	4.00	in
Local Depression Width	4.00	ft

Results

Efficiency	96.58	%
Intercepted Flow	4.94	ft ³ /s
Bypass Flow	0.17	ft ³ /s
Spread	14.04	ft
Depth	0.37	ft
Flow Area	2.06	ft ²
Gutter Depression	0.09	ft
Total Depression	0.42	ft
Velocity	2.49	ft/s
Equivalent Cross Slope	0.06143	ft/ft
Length Factor	0.85	
Total Interception Length	16.54	ft

Worksheet for Catch Basin 2

Project Description

Solve For Efficiency

Input Data

Discharge	3.91	ft ³ /s
Slope	0.01140	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	10.00	ft
Local Depression	4.00	in
Local Depression Width	4.00	ft

Results

Efficiency	80.84	%
Intercepted Flow	3.16	ft ³ /s
Bypass Flow	0.75	ft ³ /s
Spread	10.82	ft
Depth	0.30	ft
Flow Area	1.26	ft ²
Gutter Depression	0.09	ft
Total Depression	0.42	ft
Velocity	3.12	ft/s
Equivalent Cross Slope	0.07270	ft/ft
Length Factor	0.60	
Total Interception Length	16.65	ft

APPENDIX E.4: EARTHEN CHANNEL NORMAL DEPTH CALCULATION

Worksheet for Basin Outlet Channel

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.030
Channel Slope	0.00550 ft/ft
Bottom Width	10.00 ft
Discharge	20.50 ft ³ /s

Results

Normal Depth	0.74 ft
Flow Area	7.45 ft ²
Wetted Perimeter	11.49 ft
Hydraulic Radius	0.65 ft
Top Width	10.00 ft
Critical Depth	0.51 ft
Critical Slope	0.01870 ft/ft
Velocity	2.75 ft/s
Velocity Head	0.12 ft
Specific Energy	0.86 ft
Froude Number	0.56
Flow Type	Subcritical

GVF Input Data

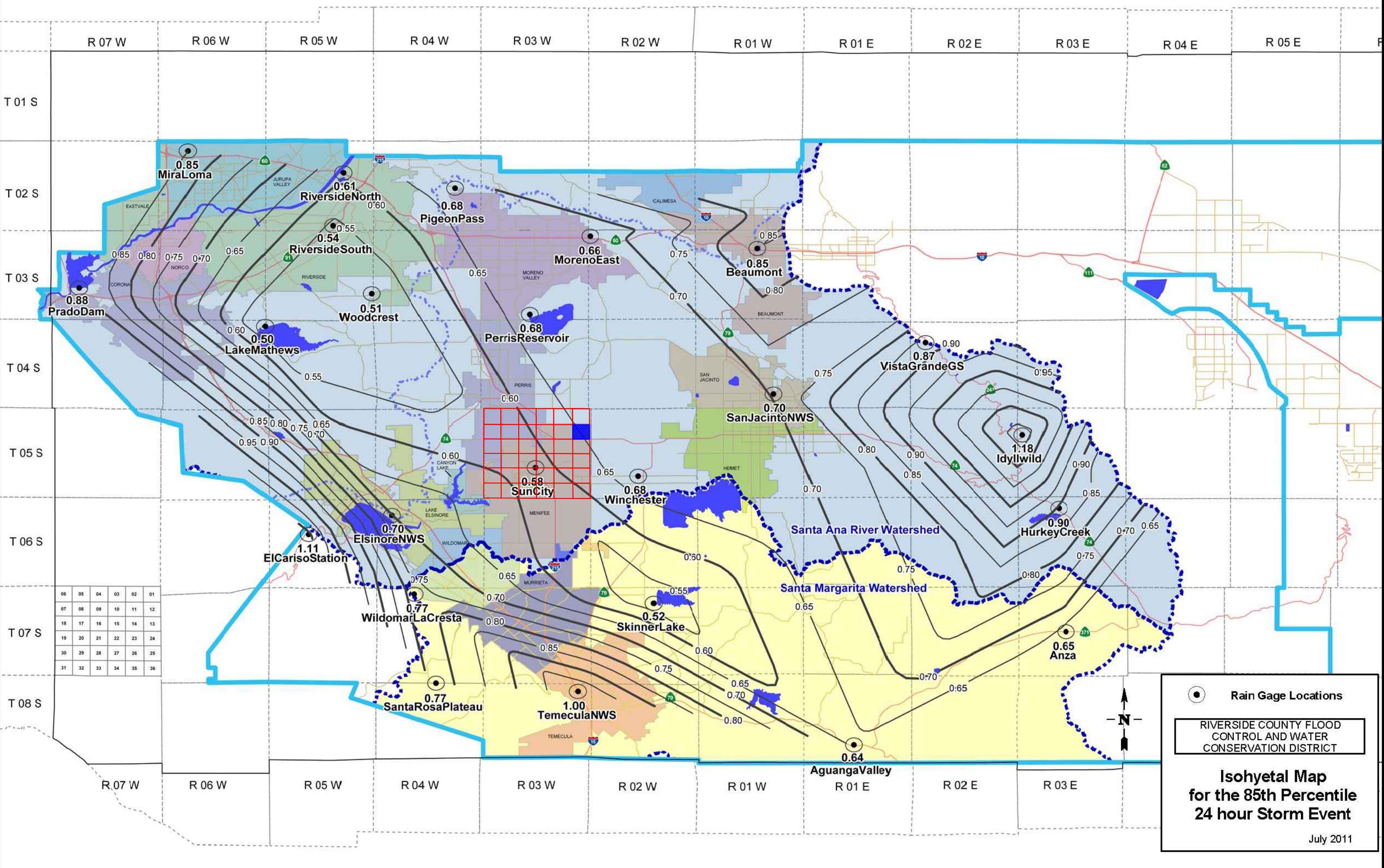
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 ft
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.74 ft
Critical Depth	0.51 ft
Channel Slope	0.00550 ft/ft
Critical Slope	0.01870 ft/ft

APPENDIX F: WATER QUALITY

APPENDIX F.1: 85TH PERCENTILE RAINFALL MAP



APPENDIX F.2: SANTA ANA WATERSHED BMP DESIGN VOLUME SPREADSHEETS

Notes:

Notes:

Notes:

APPENDIX F.3: BIORETENTION DESIGN SPREADSHEETS

Bioretention Facility - Design Procedure		BMP ID A	Legend: Required Entries Calculated Cells
Company Name:	JLC Engineering and Consulting, Inc.		Date: 7/25/2017
Designed by:	Jilleen Ferris		County/City Case No.: MR 56
Design Volume			
Enter the area tributary to this feature		A _T = 3.5 acres	
Enter V _{BMP} determined from Section 2.1 of this Handbook		V _{BMP} = 6,650 ft ³	
Type of Bioretention Facility Design			
<input checked="" type="radio"/> Side slopes required (parallel to parking spaces or adjacent to walkways) <input type="radio"/> No side slopes required (perpendicular to parking space or Planter Boxes)			
Bioretention Facility Surface Area			
Depth of Soil Filter Media Layer		d _S = 2.0 ft	
Top Width of Bioretention Facility, excluding curb		w _T = 24.8 ft	
Total Effective Depth, d _E d _E = (0.3) x d _S + (0.4) x 1 - (0.7/w _T) + 0.5		d _E = 1.47 ft	
Minimum Surface Area, A _m A _M (ft ²) = $\frac{V_{BMP} (\text{ft}^3)}{d_E (\text{ft})}$		A _M = 4,519 ft ²	
Proposed Surface Area		A = 4,932 ft ²	
Bioretention Facility Properties			
Side Slopes in Bioretention Facility		z = 4 :1	
Diameter of Underdrain		6 inches	
Longitudinal Slope of Site (3% maximum)		0.3 %	
6" Check Dam Spacing		0 feet	
Describe Vegetation:			
Notes:			

Bioretention Facility - Design Procedure (Irregular Shaped Facility)		BMP ID	Legend:	Required Entries
		A		Calculated Cells
Company Name:	JLC Engineering	Date:	7/25/2017	
Designed By:	Jilleen Ferris	County/City Case No.:	MR 56	
Design Volume				
Enter the area tributary to this feature			$A_T =$	3.5 acres
Enter V_{BMP} determined from Section 2.1 of this Handbook			$V_{BMP} =$	6650 ft ³
Type of Bioretention Facility Design				
<input checked="" type="radio"/> Irregular shaped with side slopes required (parallel to parking spaces or adjacent to walkways) <input type="radio"/> Irregular shaped with no side slopes required (perpendicular to parking space or planter boxes)				
Bioretention Facility Surface Area				
Proposed Bottom Surface Area of Irregular Shaped Facility			$A_P =$	4932 ft ²
Depth of Soil Filter Media Layer			$d_S =$	2 ft
Total Volume within Soil Media, V_S		$V_S = (A_P * d_S * 0.3) + (A_P * 0.4)$	$V_S =$	4932 ft ³
Total Surcharge Storage Volume above Soil Media, V_P			$V_P =$	2466 ft ³
Total Effective Storage Volume, V_E		$V_E = V_S + V_P$	$V_E =$	7398 ft ³
Total Effective Depth, d_E		$d_E = \frac{V_E}{A_P}$	$d_E =$	1.50 ft
Minimum Surface Area, A_M		$A_M = \frac{V_{BMP}}{d_E}$	$A_M =$	4434 ft ²
Bioretention Facility Properties				
Side Slopes in Bioretention Facility			$z =$	4 :1
Diameter of Underdrain				6 inches
Longitudinal Slope of Site (3% maximum)				0.3 %
6" Check Dam Spacing				0 feet
Describe Vegetation:				
Notes:				

Bioretention Facility - Design Procedure		BMP ID B	Legend:	Required Entries	
Company Name:	JLC Engineering and Consulting, Inc.		Date:	7/25/2017	
Designed by:	Jilleen Ferris		County/City Case No.:	MR 56	
Design Volume					
Enter the area tributary to this feature			A _T =	3.5	acres
Enter V _{BMP} determined from Section 2.1 of this Handbook			V _{BMP} =	4,128	ft ³
Type of Bioretention Facility Design					
<input checked="" type="radio"/> Side slopes required (parallel to parking spaces or adjacent to walkways) <input type="radio"/> No side slopes required (perpendicular to parking space or Planter Boxes)					
Bioretention Facility Surface Area					
Depth of Soil Filter Media Layer			d _S =	2.0	ft
Top Width of Bioretention Facility, excluding curb			w _T =	20.0	ft
Total Effective Depth, d _E d _E = (0.3) x d _S + (0.4) x 1 - (0.7/w _T) + 0.5			d _E =	1.47	ft
Minimum Surface Area, A _m A _M (ft ²) = $\frac{V_{BMP} (\text{ft}^3)}{d_E (\text{ft})}$			A _M =	2,818	ft ²
Proposed Surface Area			A=	3,086	ft ²
Bioretention Facility Properties					
Side Slopes in Bioretention Facility			z =	4	:1
Diameter of Underdrain				6	inches
Longitudinal Slope of Site (3% maximum)				0.3	%
6" Check Dam Spacing				0	feet
Describe Vegetation:					
Notes:					

Bioretention Facility - Design Procedure (Irregular Shaped Facility)		BMP ID B	Legend:	Required Entries Calculated Cells
Company Name:	JLC Engineering		Date:	7/25/2017
Designed By:	Jilleen Ferris		County/City Case No.:	MR 56
Design Volume				
Enter the area tributary to this feature		$A_T = \underline{3.5}$ acres		
Enter V_{BMP} determined from Section 2.1 of this Handbook		$V_{BMP} = \underline{4128}$ ft ³		
Type of Bioretention Facility Design				
<input checked="" type="radio"/> Irregular shaped with side slopes required (parallel to parking spaces or adjacent to walkways) <input type="radio"/> Irregular shaped with no side slopes required (perpendicular to parking space or planter boxes)				
Bioretention Facility Surface Area				
Proposed Bottom Surface Area of Irregular Shaped Facility		$A_P = \underline{3086}$ ft ²		
Depth of Soil Filter Media Layer		$d_S = \underline{2}$ ft		
Total Volume within Soil Media, V_S		$V_S = (A_P * d_S * 0.3) + (A_P * 0.4)$	$V_S = \underline{3086}$ ft ³	
Total Surcharge Storage Volume above Soil Media, V_P		$V_P = \underline{1543}$ ft ³		
Total Effective Storage Volume, V_E		$V_E = V_S + V_P$	$V_E = \underline{4629}$ ft ³	
Total Effective Depth, d_E		$d_E = \frac{V_E}{A_P}$	$d_E = \underline{1.50}$ ft	
Minimum Surface Area, A_M		$A_M = \frac{V_{BMP}}{d_E}$	$A_M = \underline{2752}$ ft ²	
Bioretention Facility Properties				
Side Slopes in Bioretention Facility		$z = \underline{4} : 1$		
Diameter of Underdrain		$\underline{6}$ inches		
Longitudinal Slope of Site (3% maximum)		$\underline{0.3}$ %		
6" Check Dam Spacing		$\underline{0}$ feet		
Describe Vegetation: _____				
Notes: _____				

APPENDIX G: INCREASED RUNOFF MITIGATION

APPENDIX G.1: UNIT HYDROGRAPH SUMMARY TABLE

		PRE-PROJECT			POST-PROJECT		
		Q (cfs)	VOL (ac-ft)	VOL (cu. Ft.)	Q (cfs)	VOL (ac-ft)	VOL (cu. Ft.)
2-YEAR	1-hour	4.529	0.1613	7,026.2	9.052	0.3001	13,072.4
	3-hour	2.365	0.1947	8,481.1	5.106	0.4943	21,531.7
	6-hour	1.522	0.2231	9,718.2	4.13	0.6179	26,915.7
	24-hour	0.564	0.3508	15,280.8	1.62	0.9887	43,067.8
5-YEAR	1-hour	7.527	0.2558	11,142.6	13.288	0.4297	18,717.7
	3-hour	4.223	0.2929	12,758.7	7.133	0.65	28,314.0
	6-hour	3.065	0.3299	14,370.4	5.675	0.8382	36,512.0
	24-hour	0.77	0.4792	20,874.0	2.213	1.3505	58,827.8
10-YEAR	1-hour	11.726	0.4403	19,179.5	17.187	0.551	24,001.6
	3-hour	7.44	0.4832	21,048.2	9.586	0.8025	34,956.9
	6-hour	6.221	0.542	23,609.5	7.944	1.0372	45,180.4
	24-hour	1.091	0.584	25,439.0	2.661	1.6242	70,750.2
100-YEAR	1-hour	20.501	0.8629	37,587.9	28.583	0.9494	41,355.9

APPENDIX G.2: BASIN STORAGE VOLUME SPREADSHEET

EXTENDED DETENTION BASIN B

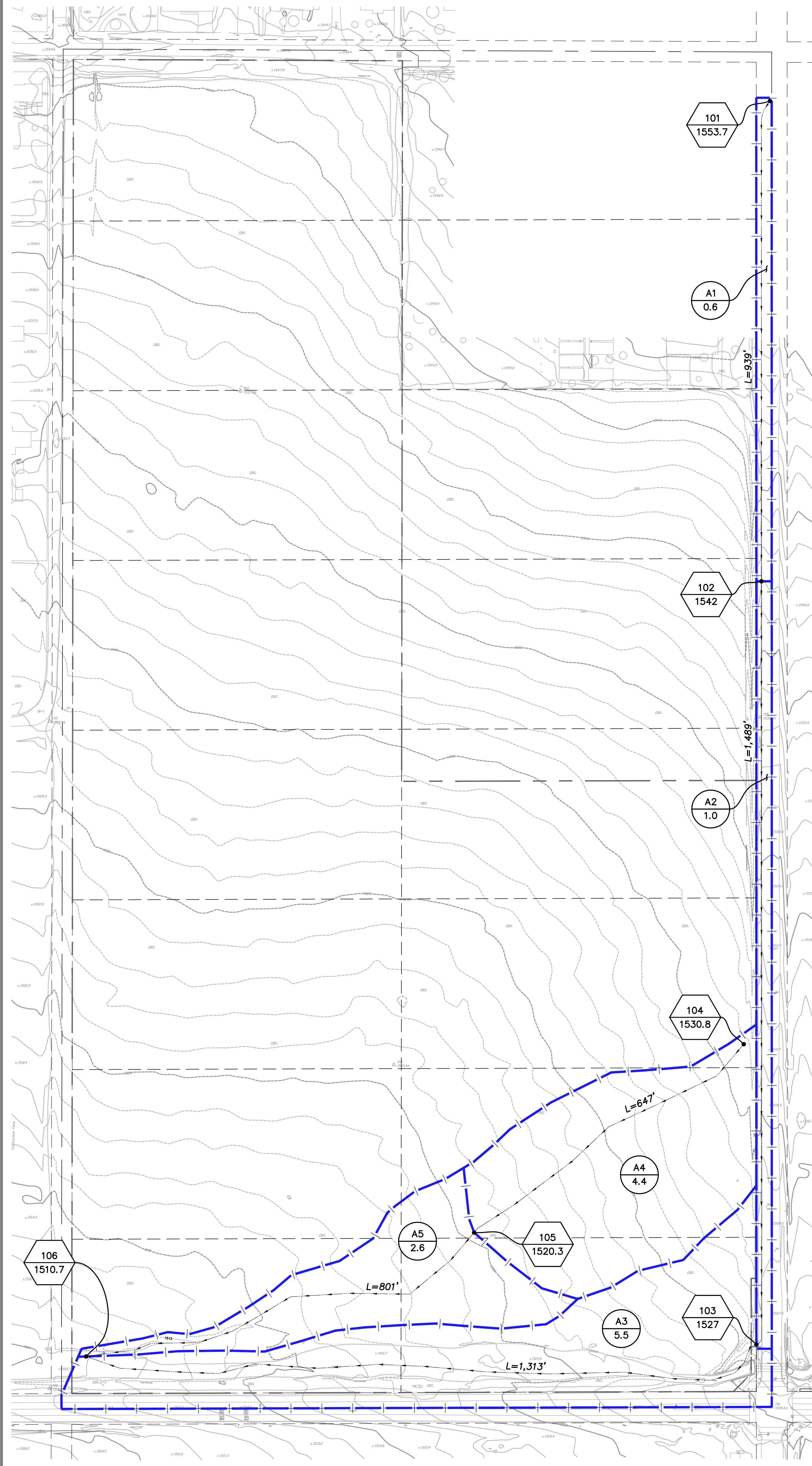
EXHIBITS

EXHIBIT A: PRE-PROJECT RATIONAL METHOD HYDROLOGY MAP

MR 56 COMMERCIAL SITE

IN THE CITY OF MENIFEE, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

EXISTING CONDITION SITE HYDROLOGY MAP



LEGEND:

- NODE/CONCENTRATION POINT FLOWLINE ELEVATION**: Hexagonal symbol with 'X.X' inside.
- APPROXIMATE INVERT ELEVATION**: Hexagonal symbol with 'XXXX.X' inside.
- SUB AREA ACRES**: Circle with 'XXX' inside.
- FLOW DISTANCE**: Circle with 'L=XXX'
- FLOW PATH**: Dashed line.
- WATERSHED BOUNDARY**: Solid line.

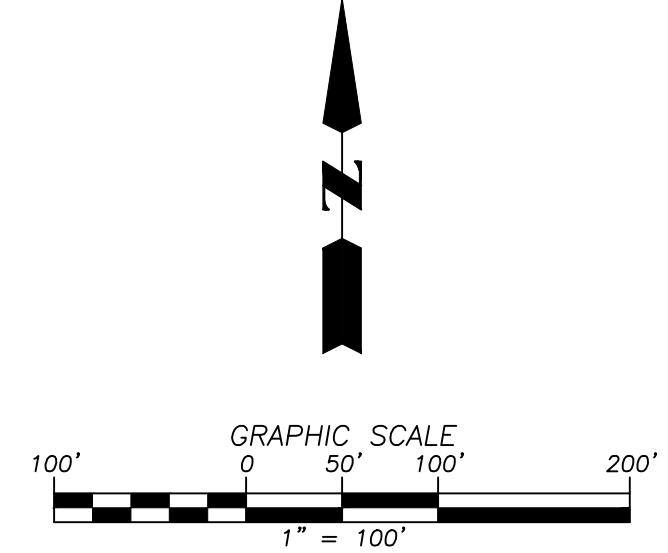


EXHIBIT "A"

JLC
Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

MR 56 COMMERCIAL SITE
EXISTING CONDITION
HYDROLOGY MAP

EXHIBIT B: POST-PROJECT RATIONAL METHOD HYDROLOGY MAP

MR 56 COMMERCIAL SITE

IN THE CITY OF MENIFEE, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

POST-PROJECT CONDITION SITE HYDROLOGY MAP

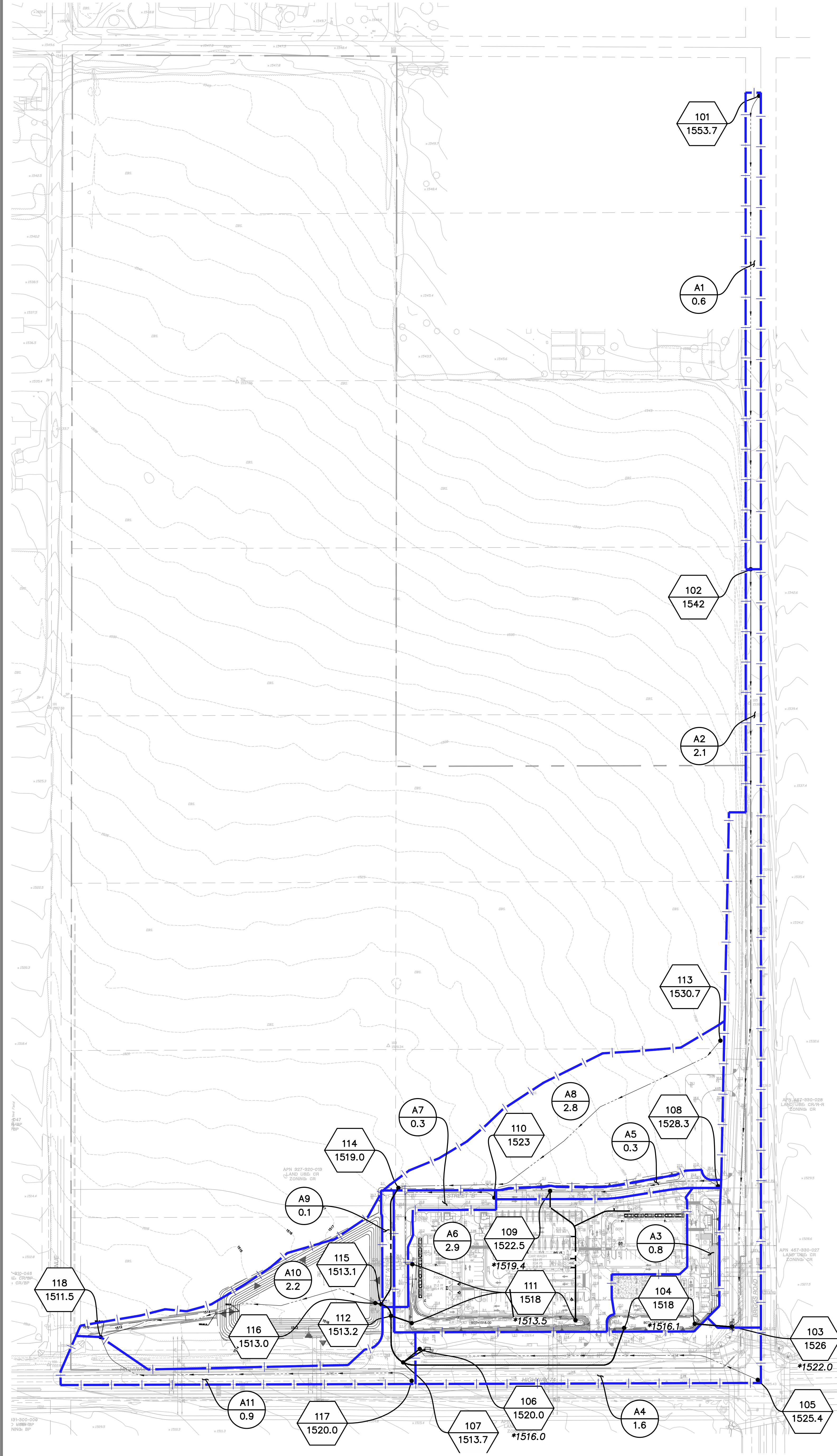


EXHIBIT C: PRE-PROJECT UNIT HYDROGRAPH HYDROLOGY MAP

MR 56 COMMERCIAL SITE

IN THE CITY OF MENIFEE, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

EXISTING CONDITION SITE HYDROLOGY MAP

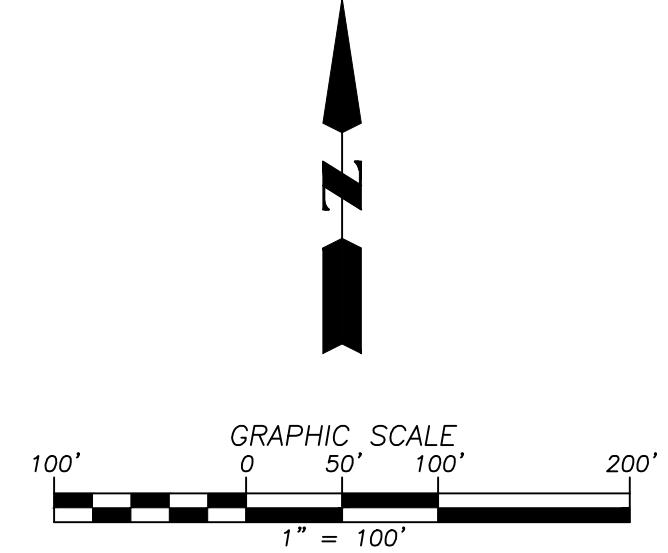
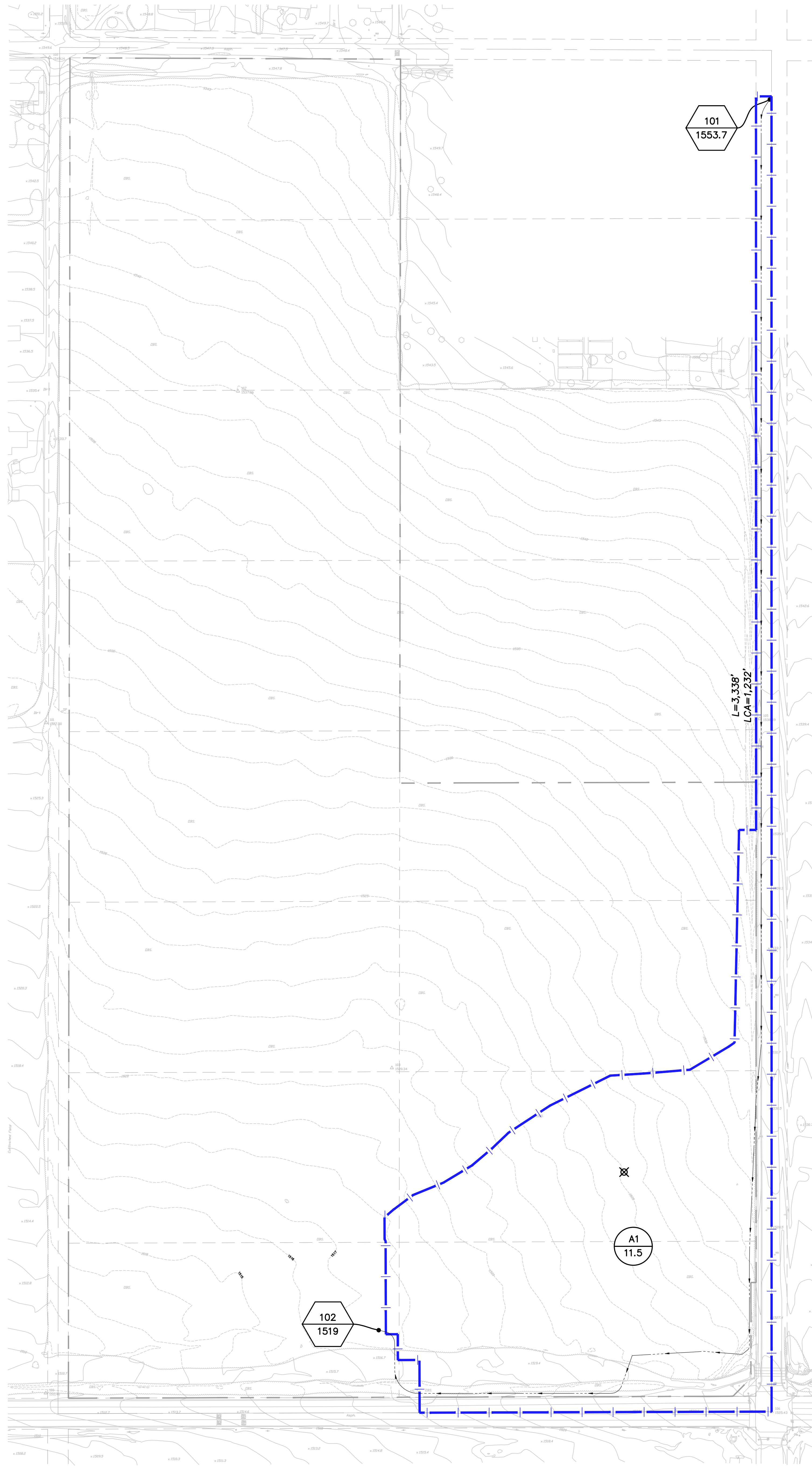


EXHIBIT "C"

MR 56 COMMERCIAL SITE
EXIST. UNIT HYDROGRAPH
HYDROLOGY MAP

EXHIBIT D: POST-PROJECT UNIT HYDROGRAPH HYDROLOGY MAP

MR 56 COMMERCIAL SITE

IN THE CITY OF MENIFEE, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

POST-PROJECT UNIT HYDROGRAPH HYDROLOGY MAP

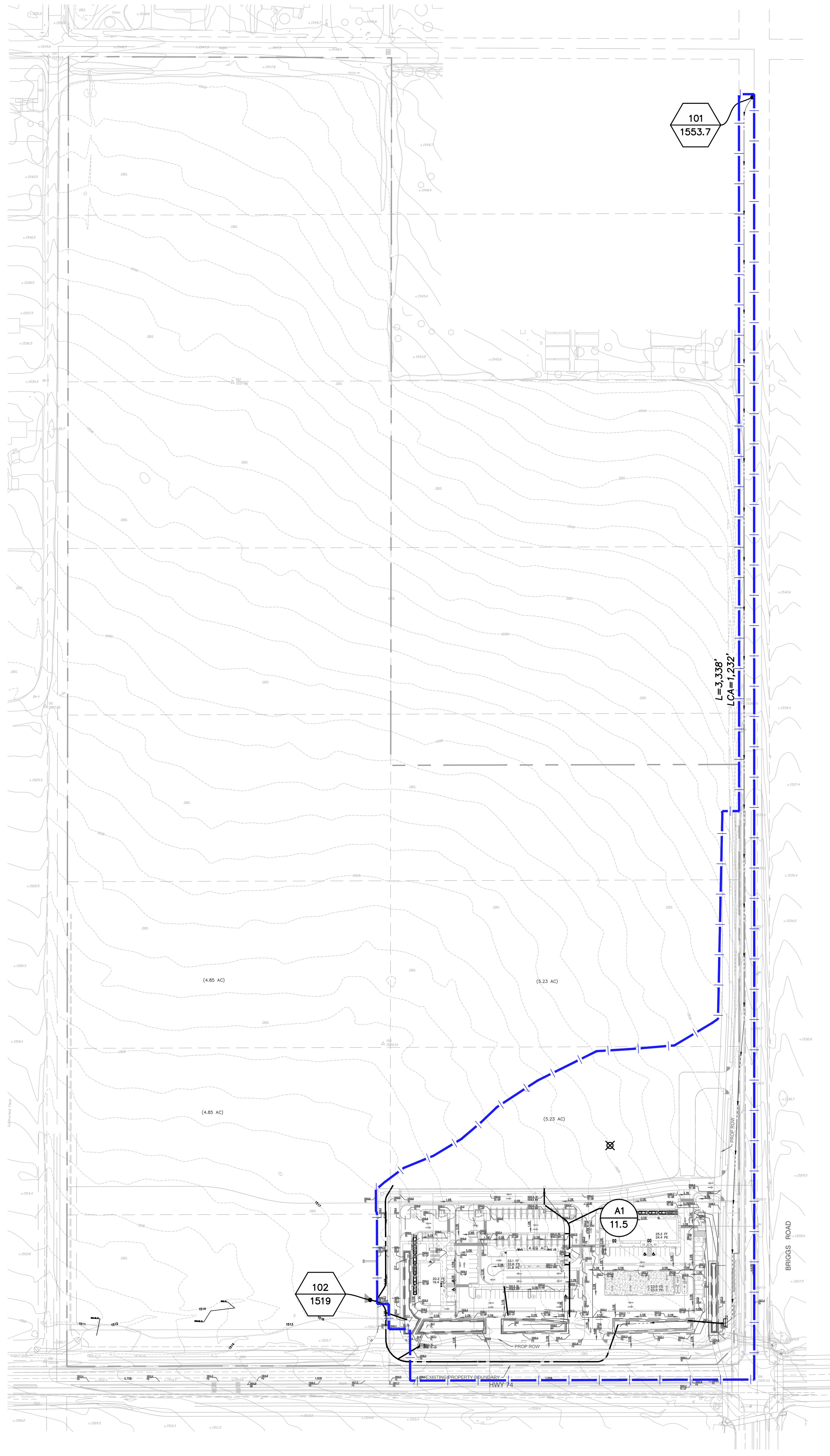


EXHIBIT "D"

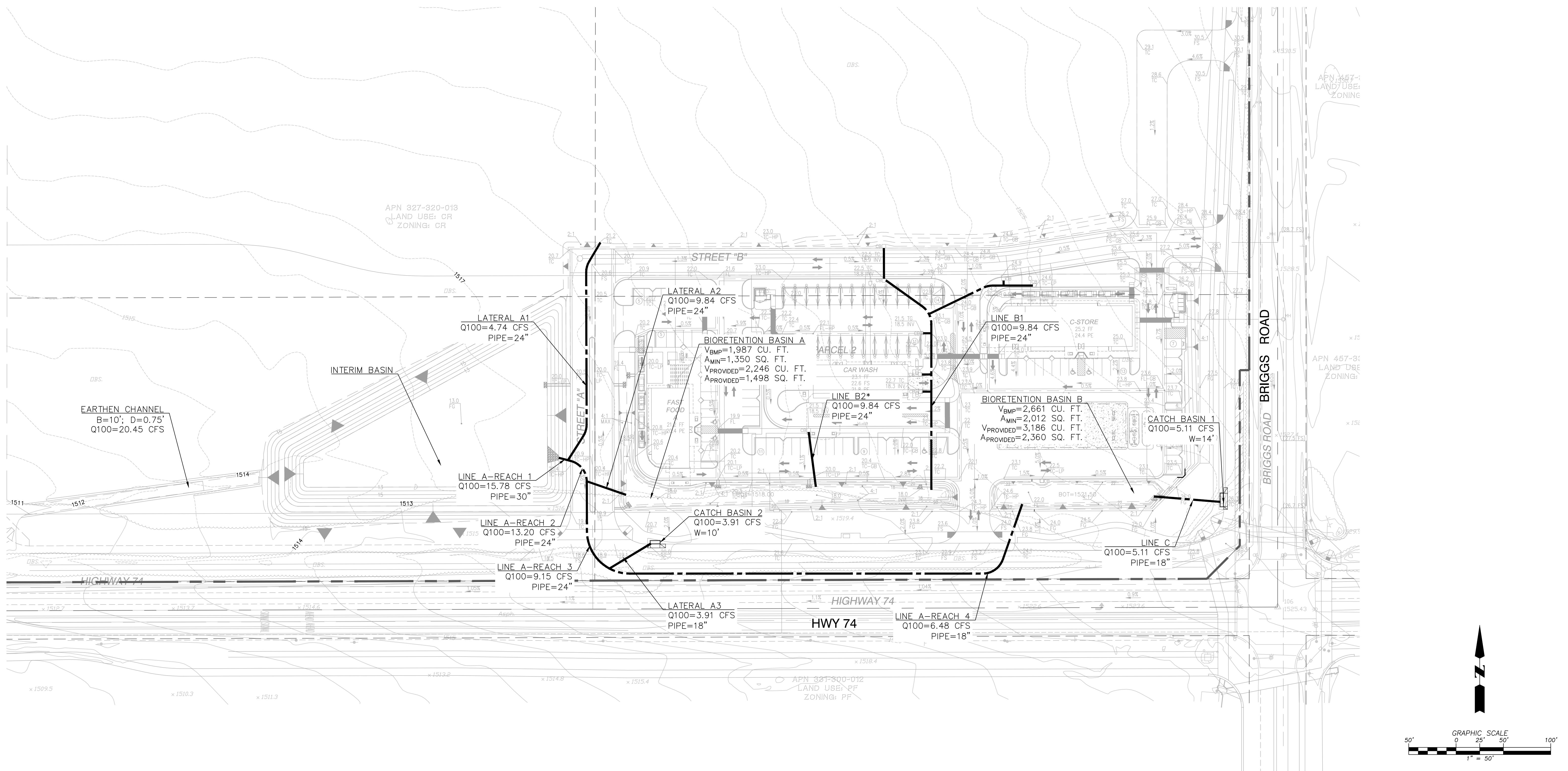
MR 56 COMMERCIAL SITE
POST-PROJECT UNIT
HYDROGRAPH MAP

EXHIBIT E: DRAINAGE FACILITIES MAP

MR 56 COMMERCIAL SITE

IN THE CITY OF MENIFEE, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

DRAINAGE FACILITIES MAP



- * LINE B2 WAS SIZED FOR THE SAME FLOW RATE AS LINE B1, WHICH IS THE PEAK FLOW RATE FROM AREA A5 AND A6, AND IS A CONSERVATIVE APPROACH. DURING FINAL ENGINEERING, DETAILED HYDROLOGY WILL BE PROVIDED FOR EACH INLET AND SIZING WILL BE PROVIDED FOR THE STORM DRAIN SYSTEMS FOR THE ACTUAL TRIBUTARY FLOW RATE. THE MAXIMUM SIZE FOR THIS SYSTEM IS A 24" STORM DRAIN, THEREFORE THIS IS REFLECTED IN THE PRELIMINARY STAGES.

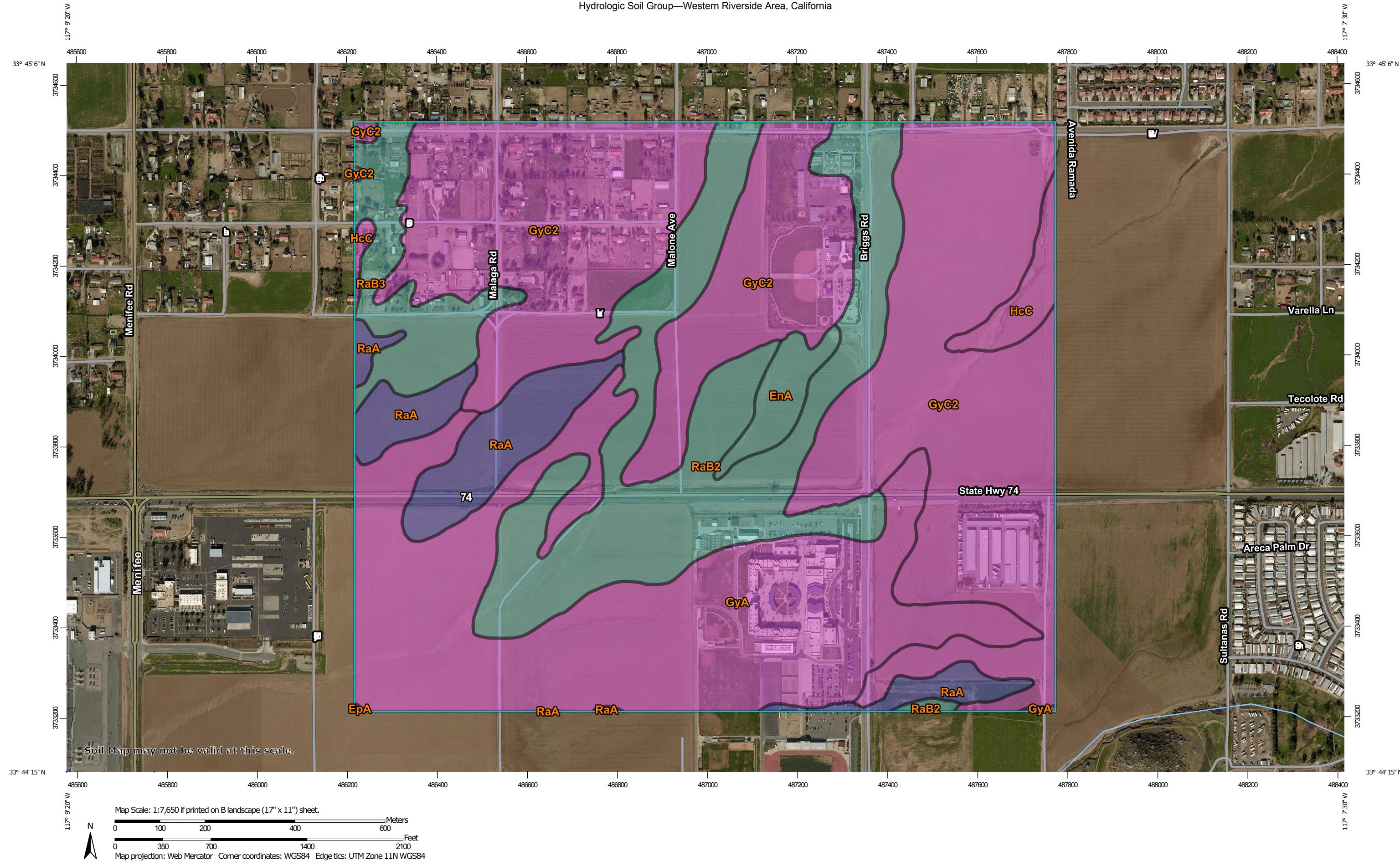
EXHIBIT "E"

MR 56 COMMERCIAL SITE

DRAINAGE FACILITIES MAP

EXHIBIT F: HYDROLOGIC SOILS MAP

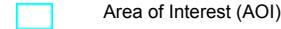
Hydrologic Soil Group—Western Riverside Area, California



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

2/9/2017
Page 1 of 4

MAP LEGEND**Area of Interest (AOI)****Soils****Soil Rating Polygons**

	A
	A/D
	B
	B/D
	C
	C/D
	D
	Not rated or not available

Soil Rating Lines

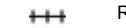
	A
	A/D
	B
	B/D
	C
	C/D
	D
	Not rated or not available

Soil Rating Points

	A
	A/D
	B
	B/D

C**C/D****D****Not rated or not available****Water Features**

Streams and Canals

Transportation

Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Western Riverside Area, California

Survey Area Data: Version 9, Sep 12, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 25, 2010—Feb 4, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Western Riverside Area, California (CA679)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EnA	Exeter sandy loam, 0 to 2 percent slopes	C	7.6	1.5%
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	C	0.1	0.0%
GyA	Greenfield sandy loam, 0 to 2 percent slopes	A	124.2	24.7%
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	A	221.6	44.1%
HcC	Hanford coarse sandy loam, 2 to 8 percent slopes	A	7.9	1.6%
RaA	Ramona sandy loam, 0 to 2 percent slopes, MLRA 19	B	31.6	6.3%
RaB2	Ramona sandy loam, 2 to 5 percent slopes, eroded	C	88.8	17.6%
RaB3	Ramona sandy loam, 0 to 5 percent slopes, severely eroded	C	21.2	4.2%
Totals for Area of Interest			503.1	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

EXHIBIT G: RAINFALL MAPS

2 YEAR, 1 HOUR

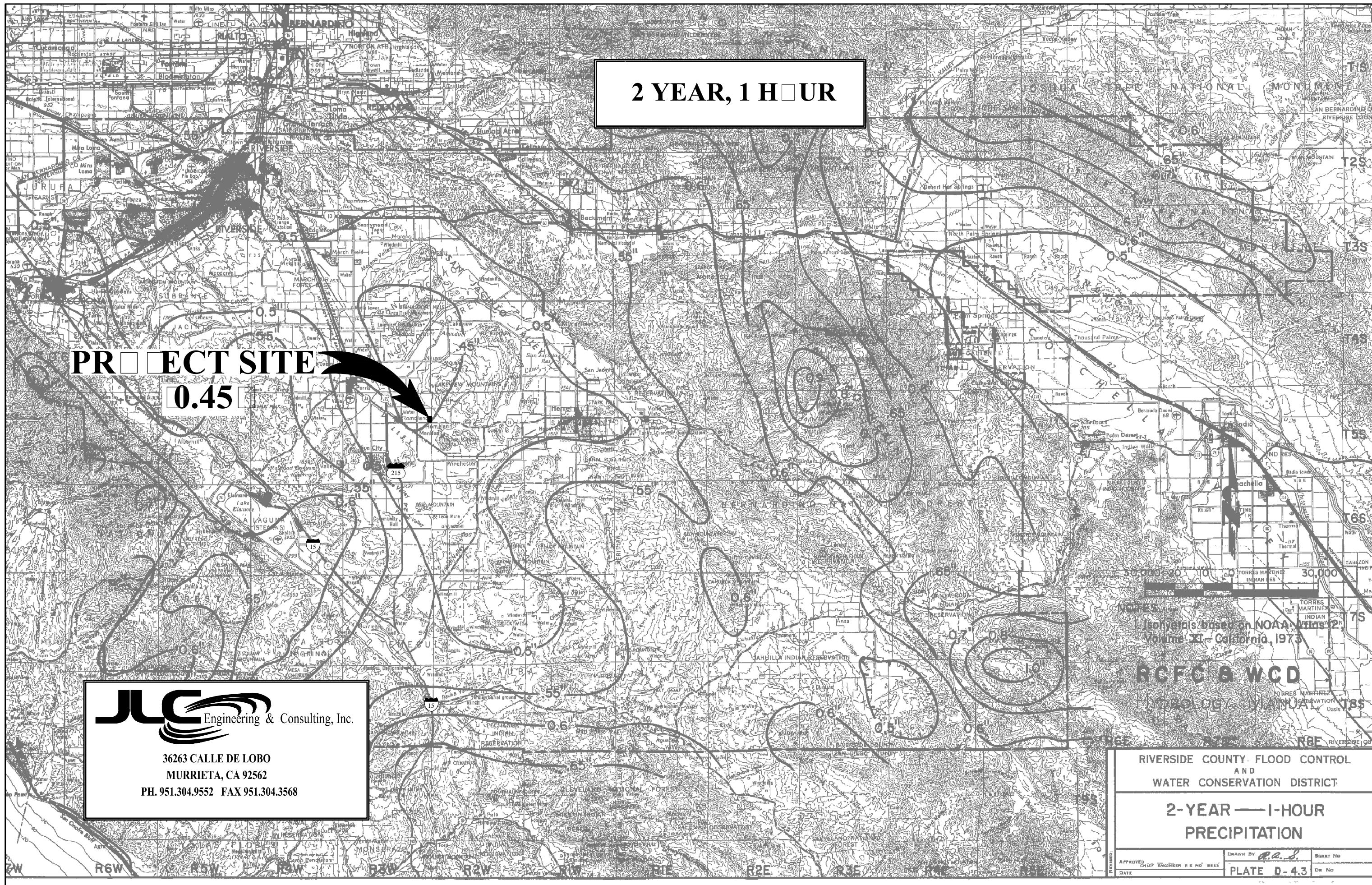
PROJECT SITE
0.45



RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

2-YEAR — 1-HOUR
PRECIPITATION

APPROVED BY: *P.A.S.* DRAWN BY: *P.A.S.* SHEET NO:
CHIEF ENGINEER RE NO: *REBZ* DATE: *10/10/01* PLATE D-4.3
REVIEWED BY: *P.A.S.* DRAWN BY: *P.A.S.* SHEET NO:
DATE: *10/10/01* PLATE D-4.3



2 YEAR, 3 HOUR

PROJECT SITE
0.80



36263 CALLE DE LOBO
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

RIVERSIDE COUNTY FLOOD CON
AND
WATER CONSERVATION DISTRI
**2-YEAR — 3-HOUR
PRECIPITATION**

DRAWN BY R.A.S.

APPROVED

2 YEAR, 6 HOUR

PROJECT SITE

1.0



36263 CALLE DE LOBO

MURRIETA, CA 92562

PH. 951.304.9552 FAX 951.304.3568

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

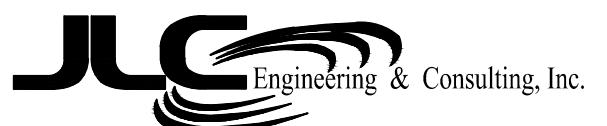
**2-YEAR—6-HOUR
PRECIPITATION**

APPROVED BY:
CHIEF ENGINEER B.E.H.
DRAWN BY:
SHEET

2 YEAR, 24 HOUR

PROJECT SITE

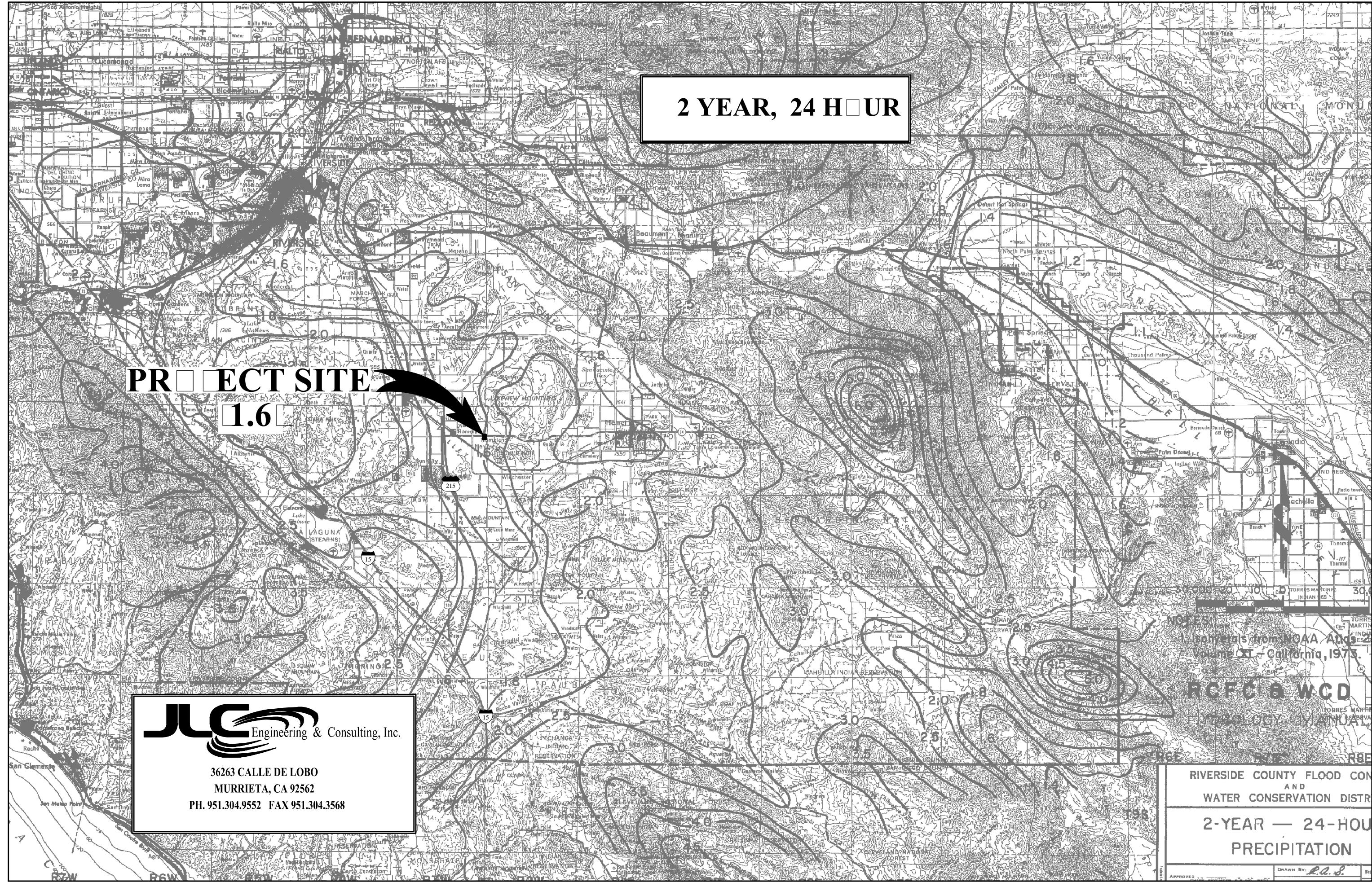
1.6



36263 CALLE DE LOBO
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

RIVERSIDE COUNTY FLOOD CON
AND
WATER CONSERVATION DISTR
2-YEAR — 24-HOU
PRECIPITATION

DRAWN BY: P.A.S.



100 YEAR, 3 HOUR

**PROJECT SITE
1.8**



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MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

RIVERSIDE COUNTY FLOOD CON
AND
WATER CONSERVATION DISTR
**100-YEAR — 3-HOUR
PRECIPITATION**

100 YEAR, 6 HOUR

PROJECT SITE

2.5



36263 CALLE DE LOBO

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PH. 951.304.9552 FAX 951.304.3568

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

**100-YEAR—6-HOUR
PRECIPITATION**

DRAWN BY P.A.S.

SHC

100 YEAR, 24 HOUR

PROJECT SITE

4.1



36263 CALLE DE LOBO

MURRIETA, CA 92562

PH. 951.304.9552 FAX 951.304.3568

RIVERSIDE COUNTY FLOOD CON
AND
WATER CONSERVATION DISTRI

100-YEAR—24-HOUR
PRECIPITATION

APPROVED
CHIEF ENGINEER R. NO. 822

DRAWN BY

SHE

SLOPE OF INTENSITY DURATION CURVE

PROJECT SITE
0.50



36263 CALLE DE LOBO
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
**SLOPE OF
INTENSITY DURATION
CURVE**

DRAWN BY *E.C.S.* SHEET NO *1*

APPROVED

